NEW ZEALAND
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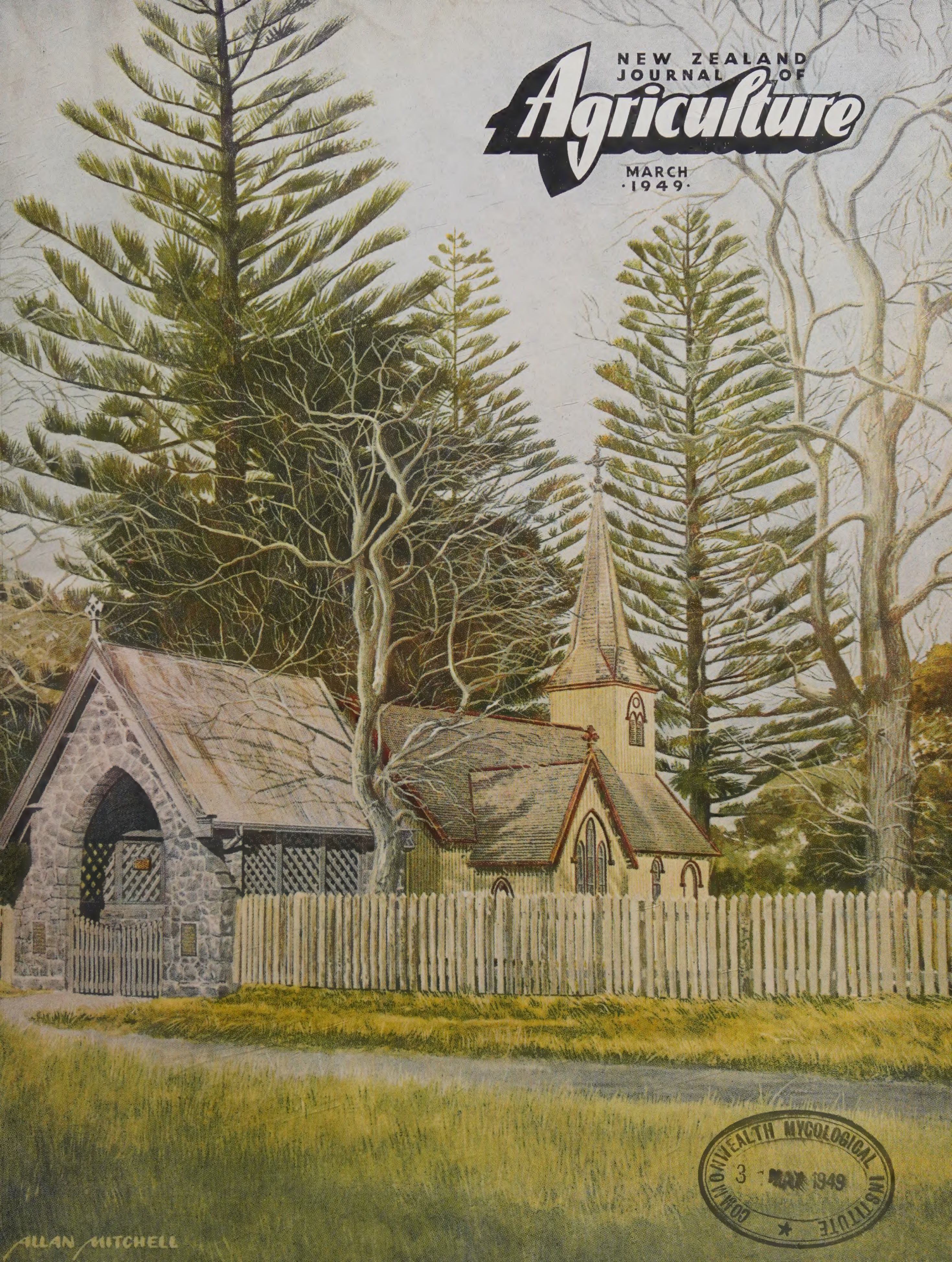
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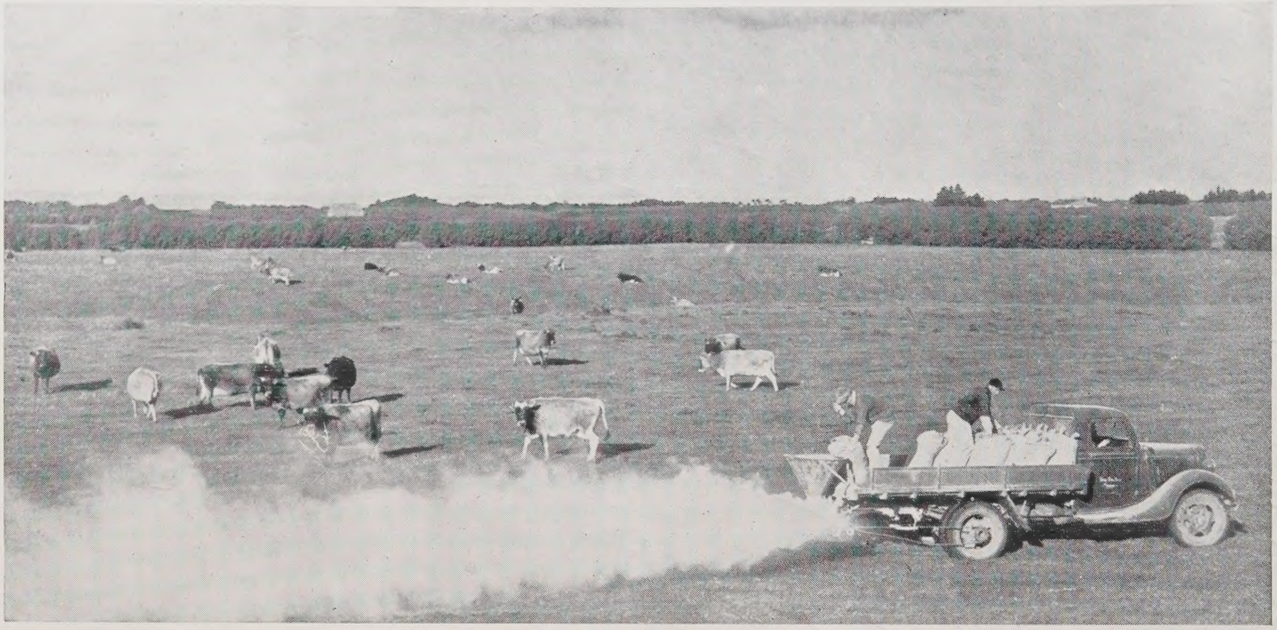

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Hon. E. L. Cullen,
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This month's cover

The Church of St. John the Baptist at Te Waimate North, in the Bay of Islands area, painted for this month's cover by L. C. Mitchell, was one of the first established in New Zealand. The first building was erected in 1831 when the mission and farm at Te Waimate were established under the guidance of Richard Davis, who managed the farm for several years before taking holy orders. The second church was built in 1839 and the third, which contains some of the timber of the first church, was built in 1871 and still stands today, a monument to the perseverance of the early missionaries and artisans of the Church Missionary Society.

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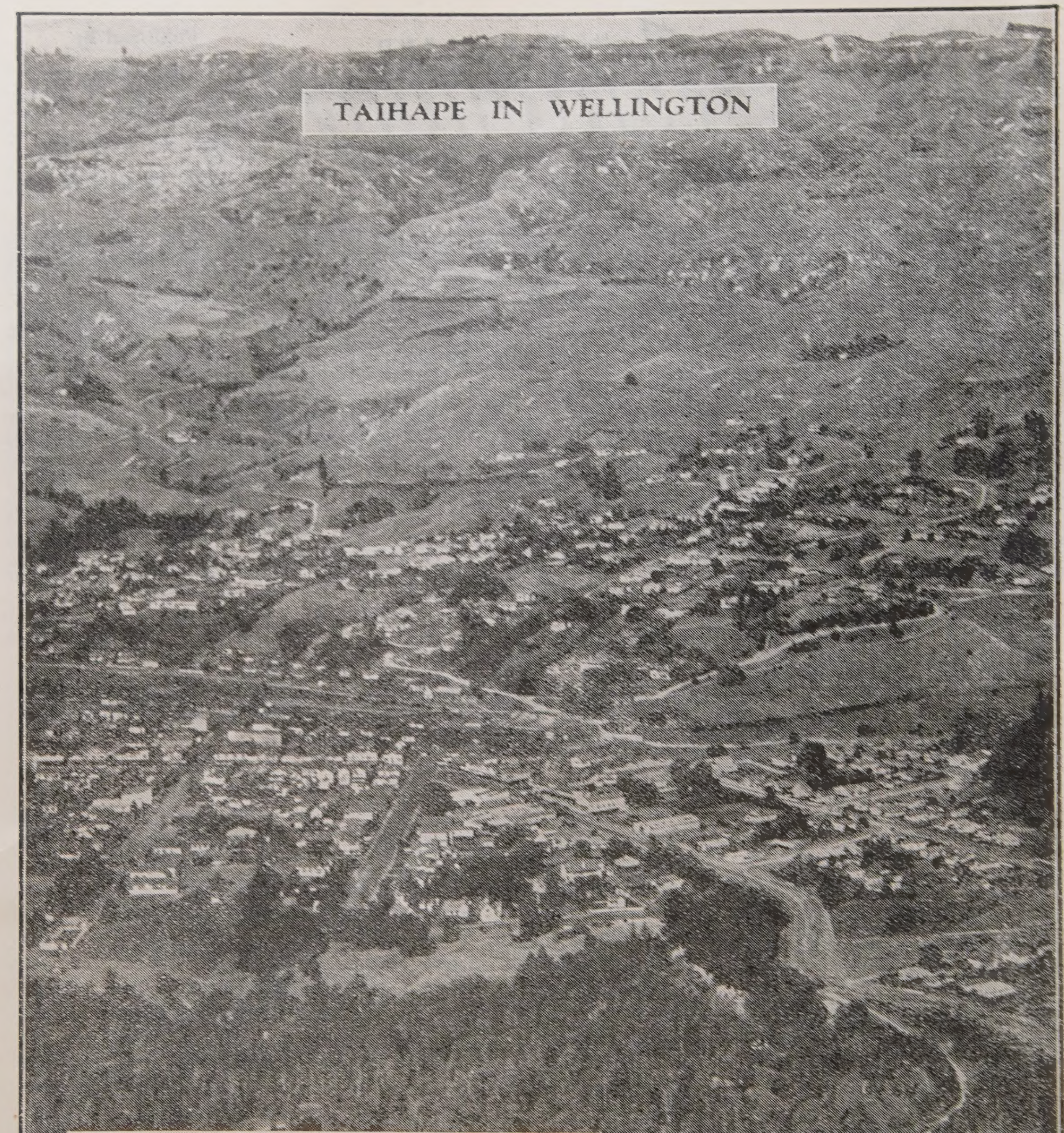
TAIHAPE IN WELLINGTON



Largest town in the northern part of Rangitikei County, Taihape is the centre of a hill-country farming district. The surrounding farmlands are noted for the quality of their breeding and store stock, which are sought by buyers from the Waikato and districts on the west coast of the North Island. Wool, fat lambs, and, to a less extent, dairy produce are additional items of farm revenue.

[V. C. Browne photo.

THE BATTLE FOR AGRICULTURAL PRODUCTION

I HAVE received the Food and Agriculture Organization's publication "The State of Food and Agriculture" published in September of last year. This document, which has been compiled very largely from data supplied by member Governments in their annual progress and programme reports, formed the basis for a good deal of the discussion at the Fourth Session of Conference of the Organization held at Washington in November.

The first part of the report deals with the current situation and the outlook for the next 3 years. Figures are quoted to show that the food situation in 1947-48 was better than that of 1946-47. More recent figures on cereals, available since the report was published, indicate that for the year 1948-49 there is virtual equilibrium between exportable surpluses and effective demand, though the latter does not by any means represent full requirements, as price and exchange factors still restrict capacity to buy.

Looking beyond 1948-49, a cautious note is sounded. Because of the rapid increase in the world's population, consumption per head is lower than pre-war, and, furthermore, the distribution of supplies is very uneven. In some countries people are living well; in others the standard continues to decline. Again, much of the present improvement is due to favourable climatic conditions, and the higher level of production may not be sustained. In any case the supply of livestock products and of oils and fats is still unequal to the demand.

Problems of the Future

The report states that "the general outlook is for the restoration by 1950 or shortly thereafter of something nearly approaching pre-war food consumption levels in most of Europe and the Far East provided that no markedly unfavourable weather intervenes." Europe will still be a heavy importer of food, especially cereals, and in Asia, while a few countries may have rehabilitated their agriculture, it is doubtful whether increases in food production will keep pace with population growth.

One of the original objectives of FAO was to endeavour to have the production of food in all countries correlated to the nutritional needs of the world's population to the end that eventually there shall be enough of the right kind of food for everyone everywhere. The attainment of this objective is fraught with many difficulties. Not only are there the physical factors such as have been encountered during the past few years—shortages of materials and the destruction of livestock and buildings by war—but also economic problems of the distribution of agricultural surpluses.

Economic Problems of Distribution

Although the long-range and most acute problem is one of the actual physical production of food because of a rapidly-increasing population, and a supply source which is, if anything, declining in area because of soil erosion, the economic problems of distribution are beginning to reappear. Already there have been a few instances of burdensome surpluses due to unexpectedly-high yields. One example is potatoes, of which we have had an instance here. The same thing has occurred on a considerably larger scale in Canada.

Surplus agricultural production in North America is being partly disposed of under Marshall Aid to Europe. It is hoped that by the time this ceases European countries will have rehabilitated their economies and be in a position to obtain their requirements by normal trading. But what of the backward countries whose requirements are boundless but whose effective demand is slight because they have nothing to give in exchange for the food they need?

This is probably the core of the problem which faces FAO and the world. A half-starved people without hope form an ideal matrix with which to mould a totalitarian state. The report emphasises that the only means of raising the food consumption and living standards in the backward countries is to raise real incomes. A serious limiting factor to production increase is investment, for when income is low the amounts that can be spared each year from current consumption are very small. "Hence, investment priorities have to be established. In short, an agricultural programme needs to be part of a general economic development programme."

New Zealand's Full Support to FAO

Dependent as New Zealand is on world trade in primary products, this aspect is of special interest to us. There is little that we can do alone. We can, however, assist by giving our full support to FAO and other specialised agencies of the United Nations endeavouring to cope with the problem.

EDWARD CULLEN,
Minister of Agriculture.

BOOK REVIEW

"Pioneers of Fertility:" Chrichton Porteous

THIS book gives short histories of 22 thoughtful men who made contributions to the advancement of farming, beginning with Fitzherbert, of Norbury, and ending with Robert Warrington. It covers briefly the changes in farming and soil-fertility-maintenance methods from the time when farmers had to rely on fallows and hardly-sufficient dung to maintain a low but constant level of fertility in their arable fields to modern times. Of particular importance were the work of Bligh in improving drainage; of Tull in cultivation and drilling crops; of Townshend, Young, Coke, of Norfolk, and the Dukes of Bedford in the introduction of turnips and clover, the development of fertility-raising rotations, and better feeding of livestock; and of Davey, Leibig, Lawes, Gilbert, Voelkner, and Warrington in the development of agricultural chemistry and the use of fertilisers.

Mr. Porteous has provided a book of interest to all land improvers, for it traces the thoughts and works of men over the centuries in their search for a more exact knowledge of soil conditions and plant growth, not only of men who defined improved practices, but of men like Wren Hoskyns who endeavoured to put improved practices into effect against the opposition of local conservatism.

—*P.W.S.*

Illustrated with line drawings by Michael Ayrton.

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RADIO BROADCASTS

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

April 6—"Current Farm Problems for the Month," by J. E. Bell, Fields Superintendent, Department of Agriculture, Auckland, A. J. Kerse, Fields Instructor, Department of Agriculture, Auckland, and H. Woodyear-Smith.

April 13—"Bring Your Young Stock through the Winter in Good Condition," by I. G. Watt, Veterinarian, Department of Agriculture, Auckland.

April 20—"Early Days at Howick," by Mrs. E. Topping, Rural Sociologist, Department of Agriculture, Auckland, and Miss Nixon, Howick.

April 27—Young Farmers' Clubs session, by G. Mandeno, chairman, Auckland Council.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.20 p.m.

◆

METEOROLOGICAL RECORDS FOR JANUARY

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Auckland	160	65.4	—1.0	77.8	52.3	1.91	22	—1.20	0.52	12	215.9
Tauranga	10	64.2	—0.4	82.1	44.2	3.56	12	—0.55	0.70	4,6	255.2
Ruakura	131	61.4	—2.4	78.2	41.2	2.04	15	—1.69	0.43	6	228.4
Rotorua	980	61.5	—1.4	84.0	42.0	3.45	14	—0.93	0.78	7	227.6
Gisborne	12	62.8	—3.0	82.0	40.0	4.30	12	+0.85	1.13	13	229.8
New Plymouth ..	160	61.6	—1.1	76.0	49.0	2.88	15	—1.63	0.74	12	241.5
Napier	6	63.7	—1.8	78.9	44.2	6.14	17	+3.48	1.16	3	229.4
Taihape	2157	57.4	—1.8	78.0	37.0	3.34	18	+0.03	0.78	26	
Wanganui	72	62.4	—0.9	79.6	42.0	2.78	12	—0.11	0.75	3	234.7
Palmerston North	110	61.0	—1.6	78.6	36.0	3.67	19	+0.72	0.83	7	217.0
Waingawa	350	59.8	—2.6	82.3	37.0	3.01	9	+0.48	0.83	3	198.3
Wellington	415	59.4	—1.8	76.0	44.3	2.25	13	—0.73	0.68	2	195.1
Nelson	24	61.8	—1.0	81.7	41.4	3.44	13	+0.44	0.99	2	223.4
Blenheim	12	59.7	—4.3	89.1	36.5	2.26	8	+0.52	0.63	26	220.4
Hokitika	12	57.4	—0.7	74.3	36.6	9.95	17	—0.16	2.89	6	208.1
Hanmer Springs ..	1225	55.6	—4.3	86.8	32.0	4.39	14	+0.72	0.74	2	161.1
Christchurch ..	22	58.8	—2.7	90.5	41.0	3.45	12	+1.25	1.19	7	179.7
Ashburton	323	58.4	—2.2	88.4	32.6	2.70	13	+0.13	0.74	25	155.5
Timaru	56	59.0	—1.7	86.8	38.8	2.05	13	—0.33	0.50	3	172.4
Alexandra	520	59.8	—1.8	86.1	34.6	3.26	15	+1.50	1.88	7	193.6
Taieri	80	55.6	—2.2	75.8	31.9	1.63	16	—0.89	0.41	6	
Invercargill ..	32	55.6	—1.3	80.5	34.0	3.56	22	—0.48	1.10	30	172.1

Fruit Crop Estimates for February

THE following estimates of the fruit crop for February, 1949, in 000's of bushel cases, are provisional and revised monthly for the period November to March and are summarised from information supplied by field officers of the Horticulture Division, Department of Agriculture.

FRUIT	DISTRICT									
	Auckland	Gisborne	Hawke's Bay	Manawatu Wanganui	Wairarapa	Nelson	Marlborough	Canterbury North Otago	Central Otago	Total
APPLES—										
Ballarat	40	8	60	1	1	7	5	9	2	133
Cox's Orange Pippin ..	6	3	60	1	1	92	9	12	8	192
Delicious	26	8	85	1	5	137	17	27	44	350
Dougherty	17	5	55	—	—	21	2	—	—	100
Granny Smith	53	2	100	2	2	56	1	2	2	220
Gravenstein	23	—	35	—	—	42	1	1	1	103
Jonathan	9	—	40	—	1	219	17	14	14	314
Sturmer	5	5	170	5	12	298	23	44	30	592
Other varieties	82	4	137	4	2	115	17	52	41	454
Total	261	35	742	14	24	987	92	161	142	2458
PEARS—										
Beurre Bosc	3	—	3	—	—	7	—	—	—	13
Louise Bonne de Jersey	—	—	12	—	—	—	—	—	—	12
Packham's Triumph ..	5	—	4	—	—	2	—	—	—	11
P. Barry	3	1	11	—	1	3	—	1	—	20
W. B. Chretien	17	—	40	—	—	25	—	2	6	90
Winter Cole	1	1	45	—	1	20	1	5	2	76
Winter Nelis	—	1	50	—	—	8	—	1	4	64
Other varieties	19	1	7	2	—	8	1	7	5	50
Total	48	4	172	2	2	73	2	16	17	336
OTHER FRUITS—										
Peaches	39	6	260	1	—	55	4	7	87	459
Apricots	1	—	2	—	—	—	—	8	118	129
Nectarines	1	1	25	—	—	1	1	2	18	49
Plums	45	6	43	1	—	8	1	6	23	133
Cherries	—	—	1	—	—	1	1	2	8	13
Quinces	9	1	9	—	—	9	—	—	1	29

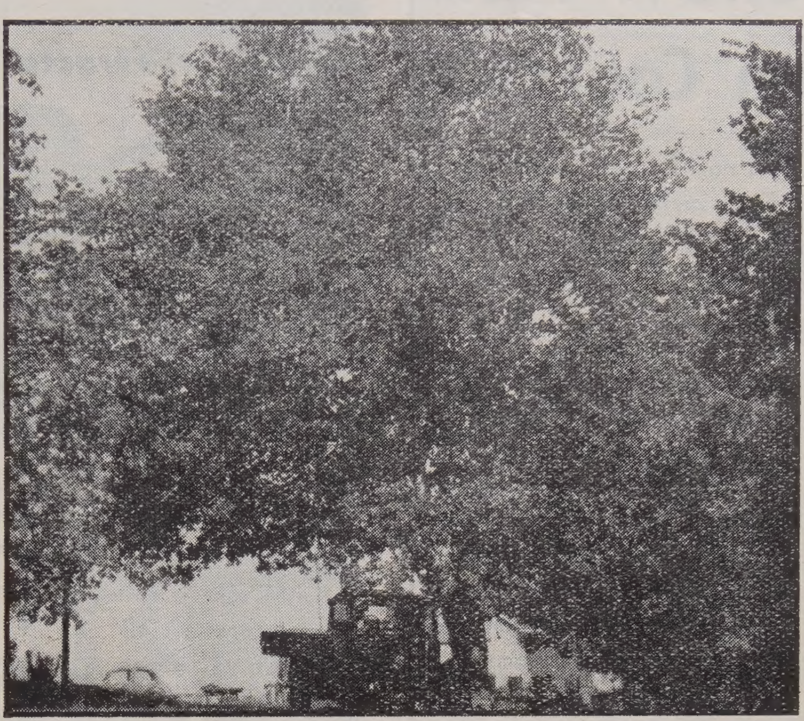
Developments in Control of Wasps

QUEEN wasps of the species *Vespa germanica* are attracted by honey-dew on oak trees and certain large hedges in spring. This article describes experimental power spraying of these plants with D.D.T. as a means of wasp control, and the attraction and destruction of queens and workers by synthetic sprays mixed with D.D.T. The use of D.D.T.-impregnated lures for killing hibernating queens in autumn is recommended. It was written by T. Palmer-Jones, Research Officer, Animal Research Station, Wallaceville; E. P. White, Chemist, Animal Research Station, Ruakura; B. W. Devine, Assistant Wasp Control Officer, Hamilton; and C. R. Paterson, Apiary Instructor, Hamilton, all officers of the Department of Agriculture.

QUEEN wasps of the species are attracted to certain plants by honey-dew excreted by the insects which infest them, as described in the "Journal" for December, 1948. Spraying of such plants with D.D.T. was recommended as a means of destroying the queens. Since the publication of that article further field work in the Waikato district has resulted in the discovery of additional sources of honey-dew which attract queens in spring.

Trees and Plants Affected

Flowering gum: Last November a flowering gum tree in Hamilton was reported to have been attracting queen wasps in large numbers for weeks. Inspection of the tree revealed the presence of many queens, which were also seen in large numbers on later visits. The tree was heavily infested with scale insects, and its leaves and smaller branches were sticky with honey-dew, on which the queens were feeding. The thin leaves and lack of dense foliage on the gum tree made it unsuitable for holding spray in wet weather. However, it was sprayed with 2oz. of 50 per cent. D.D.T. dispersible powder per gallon of water. Wasps and flies picked off the leaves a few hours after spraying showed symptoms of D.D.T. poisoning at once and died a few hours later. Unfortunately, torrential rain fell during the night and at frequent intervals during the following 11 days. Four days after spraying, queens were still alighting on the tree and when picked off the leaves and kept in jars died of D.D.T. poisoning. Eleven days after spraying, queens collected from leaves took 11 hours and longer to die, showing that the spray was then not very effective. Though both the nature of the tree's foliage and the heavy rains imposed a severe test on the efficacy of the spray, it must have killed many queens.



The large English oak tree at Rukuhia which attracted queen wasps.

Hawthorn hedge: A large hawthorn hedge on a farm in Hamilton was found to have been attracting queen wasps for weeks. The hedge was slightly infested with insects excreting honey-dew. Though extensive hawthorn hedges elsewhere in Hamilton were inspected, none was observed to attract wasps.

Miscellaneous plants: A plum tree and a barberry hedge with the usual insect infestation, resulting in the presence of honey-dew, were found to attract queens. Eleagnus hedges appear to lose their attractiveness for queens during November.

English oak trees: The most spectacular and widespread case of attraction of queen wasps by honey-dew was first observed in November. On the 16th of the month it was found that queen wasps were attracted by the honey-dew on a large English oak tree at Rukuhia. The honey-dew was excreted by the oak aphis and was produced on such a lavish scale that at times it could be seen falling to the ground like a fine rain. On November 18 hundreds of queens and a few workers were feeding on the honey-dew. Queen wasps were observed on the tree, at times in hundreds, until it was sprayed with D.D.T. at the end of the month. No bees were seen on the oak. English and other types of oak tree are widespread in the Waikato, and a survey of those in the Hamilton area led to the discovery that almost all English oaks (*Quercus robur*) were infested with aphides excreting honey-dew, but no infestation or wasp attraction was observed with other species. In most cases queen wasps, sometimes in large numbers, were attracted by the honey-dew on the oaks. Oaks in the country areas appeared much freer from infestation than those in Hamilton. In only 2 instances were bees seen on the oaks, and in these cases their numbers were few.

Power Spraying with D.D.T.

An improvised power spraying plant which consisted of a motor-driven paint sprayer was used to spray water-miscible D.D.T. (2oz. of 50 per cent. D.D.T. per gallon of water) over 2 oak trees and a hawthorn hedge which attracted queens.

The first oak to be sprayed was that at Rukuhia and it was treated on the morning of November 29. At 5 p.m. on the same day hundreds of queens were on the oak. Three queens collected from the leaves and kept in jars under observation all showed symptoms of D.D.T. poisoning and died during the night. On December 3 only a few queens were on the tree, though much honey-dew was being produced. On both December 5 and 6 only 1 queen was seen on the tree, though flying conditions were of the best and enormous quantities of honey-dew were being produced.

An oak tree and a hawthorn hedge in Hamilton were power sprayed with D.D.T. In both cases only a few queens were seen after spraying, but wet weather and the fact that not many queens had been attracted initially made assessment of kills more difficult.

Results from these trials were so encouraging that large-scale experimental spraying of oaks was planned

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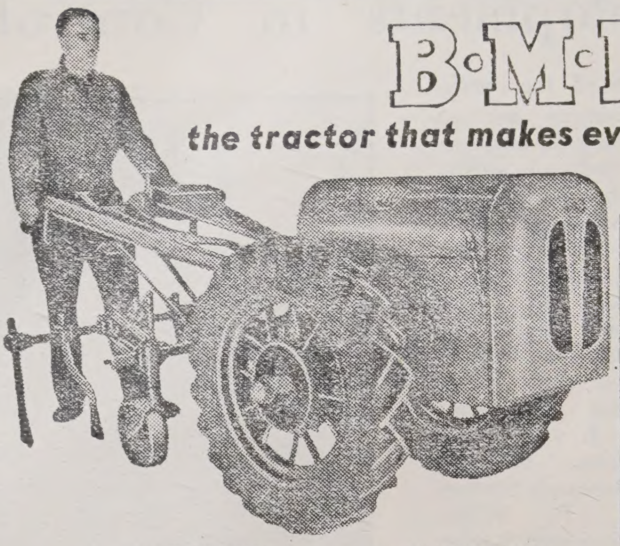

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in Hamilton. However, the makeshift spray equipment used previously was unsuitable for such a programme, and before satisfactory equipment could be assembled the attraction of honey-dew for queens had passed.

It is apparent that spraying should be carried out in the Waikato not later than early December, after which the attraction of honey-dew for queens wanes rapidly.

Plant Exudate and Nectar

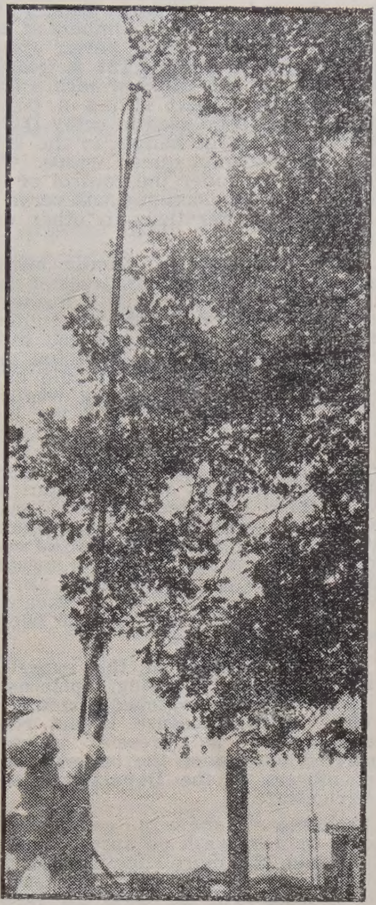
In November queen wasps were seen to be attracted by common rhododendron plants in a Hamilton nursery. The plants were not infested with insects, but the buds and upper stems were sticky with an exudate which was the source of attraction. Workers in the nursery had observed the attraction of rhododendrons for queens over several weeks. Rhododendrons in another part of Hamilton attracted queens similarly.

A species of cotoneaster (provisionally *C. simonsii*) at Taupiri was found to be attracting queen wasps on November 19. The cotoneaster continued attracting queens until it ceased flowering about a month later, and during that period 37 queens were caught on the plant. A survey of Hamilton and the surrounding district led to the discovery that queens were being attracted in many places by the same species, sometimes more than 8 at a time being observed on a plant. A different species of cotoneaster (provisionally *C. franchetii*), which flowered later, was found to exert the same attraction. None of these cotoneasters was infested with insects and no honey-dew or plant exudates were present, but the queens were feeding on nectar in the flowers. The cotoneasters attracted both hive bees and humble-bees in small numbers but sufficient to make spraying with D.D.T. inadvisable.

It is significant that these 2 cotoneaster species which belong to the group with upright flowers attracted mainly queen wasps, while the more common cotoneaster species with flat flowers attracted bees in very large numbers but wasps were never observed on them. It is significant also that considerable numbers of queens were observed on these cotoneasters as late as December 20, when honey-dew sources such as those on the oak are still common but seem to exert no attraction for the wasps. At this time the number of wasps flying had diminished very considerably.

Attraction by Sprays

The field work carried out on wasps in the Waikato continually emphasised the strong attraction of honey-dew for queens in spring. This naturally led to a consideration of the possibility of attracting queen wasps artificially by spraying solutions of substances over trees and plants. If queen wasps could be so attracted without attracting bees, it would be possible to kill them by means of D.D.T. incorporated in the spray. It was thought at first that chemical work on honey-dews which attracted queens might be necessary before a synthetic substitute could be built up, but the wide diversity in the types of honey-dew which attracted queens, together with the discovery that a plant exudate could attract them similarly, thus showing that the passage of sap through an insect was not always necessary, indicated that a simpler method of attack might be successful. Accordingly, the experimental approach to the problem was conducted along the lines of first discovering whether queen wasps could be attracted by common sugars, and, second, if they were, finding methods of making these baits selective—that is, unattractive to bees.



Power spraying an oak tree with D.D.T.

Preliminary experiments, consisting of spraying sucrose and glucose solutions over small maple trees with a hand spray pump, showed that though many hive bees were attracted by glucose it was less attractive to them than sucrose. Spray experiments were then carried out on a stretch of abelia hedge near the flowering gum tree which attracted queen wasps. It was realised that queens had been conditioned to visit the gum for honey-dew and it would be difficult to compete against such a source of attraction, but it was hoped to obtain valuable information. Several hives were kept a few yards away so that the attraction of the sprays for bees would be well tested.

In all references to the strengths of solutions in this article the metric system is used; 1oz. is equivalent to about 28 grammes (g.) and a pint is equivalent to 568 millilitres (ml.).

Glucose: An aqueous solution of glucose (1/3 g. per ml.) was sprayed over 6yds. of abelia hedge facing the sun at a time when queens were being attracted by the gum. The spray attracted many hive bees, which removed most of it in 24 hours, the portion remaining drying to a powder. Within 3 hours of spraying, queen wasps were attracted to the spray and until its removal several at a time were observed eating the glucose. While the spray was fresh and moist, queen wasps stayed up to 5 minutes on a leaf gorging themselves.

Sucrose: A sucrose solution (1 g. per ml.) tested similarly was found to attract queens, but hive bees were attracted in much greater numbers than by the glucose spray.

Lactose: A lactose solution (¼ g. per ml.) attracted no insects.

Though not very conclusive, the experiments showed that queen wasps could be attracted by glucose and sucrose solutions sprayed on plants. Work with sucrose and lactose sprays was discontinued, as the first attracted too many bees and the second was completely unattractive. These experiments had been conducted only a few yards from a tree which was continually attracting queens. The next stage in the trials was an attempt to attract queens by the glucose spray (1/3 g. per ml.) in areas where they were not usually seen. Peachgrove Road, Hamilton, was such a district.

A passion vine growing against a wall exposed to the sun in Peachgrove Road was sprayed with the glucose solution on November 16, and observations were made at intervals daily for 6 weeks. The spray was renewed when necessary. Within 24 hours of spraying, queens appeared on the vine and were seen at intervals there throughout the period of application of the spray. The average number present when the weather was fine was 2 rising at times to 4. Odd queens were seen on the vine even in very cold weather. Two queens marked with red enamel returned repeatedly to the vine for 16 days, showing that they had been conditioned to go there for food.

The experiment was repeated in the grounds of a nursery some 2 miles from Peachgrove Road. A few queens had been observed 5 days previously on rhododendrons in the nursery, and odd ones had been noticed since, so that the density of queens was probably slightly greater than at Peachgrove Road. The glucose spray was applied on November 16 to a maple tree about 6ft. high growing in a sheltered portion of the nursery, and observations were made for 9 days. A nearby maple was sprayed similarly on November 20 and observations were made for 5 days. In both cases sprays were renewed when necessary. Within 24 hours of spraying, queens appeared on the trees and averaged 6 at a time on the leaves of each when the weather was fine.

The discovery that up to 6 queen wasps at a time could be attracted to small plants sprayed with glucose in areas where queens were rarely seen showed that the spray was probably as effective in attracting them as honey-dew. Unfortunately, bees were attracted in large numbers, making the incorporation of D.D.T. in the spray undesirable.

A Selective Spray

The final stage in the experiment consisted of trials which had as their objective the discovery of a selective spray which would attract queen wasps but few if any bees. In the carrying out of these trials observations were made at intervals over a period of days in the same way as in the testing of glucose solutions. The trials were mainly carried out in the nursery, as bees were known to be readily attracted there by glucose sprays.

Among the solutions tried 1 per cent. saccharin, and a mixture of 2 per cent. calcium chloride, 3 1/3 per cent. dextrin, and 23 per cent. glucose, failed to attract any insects. A solution of .1 per cent. agar plus 1/3 g. glucose per ml. was successful in attracting queens, but though not very many bees were attracted it was not sufficiently selective. Inverted sucrose was found equally attractive to queens and even more selective.

Finally it was found that a mixture of glucose (200 g.), sucrose (160 g.), and dextrin (40 g.) in 2000 ml. water was as successful as glucose in attracting queens and attracted a maximum of 6 hive bees in a long trial. This mixture corresponds approximately in composition to the main constituents of one of the natural honey-dews. It does not dry up when sprayed but remains sticky. The dextrin appears to be the ingredient in the spray which makes it unattractive to bees.

The aqueous vehicle in which the solids are dissolved dries up and leaves a mixture of the solids on the plants. The effect of weather is important, as light rain or heavy dew moistens the dry sprays and makes them more attractive to bees and other insects.

In the course of observations on the attraction of sprays, a point of particular interest was that the queens almost always arrived in "waves." At one moment no queens or only 1 or 2 would be on the spray, and then a "flight" would appear and settle. It is possible that groups of nests become established near sources of honey-dew.

Worker wasps were seen on the sprays on only a few occasions. It appears that the queen wasps attracted to sprays and honey-dews use these as a source of energy for themselves while collecting insects as food for their developing brood. Queens rapidly ceased to be attracted by honey-dey and sprays from mid-December onward.

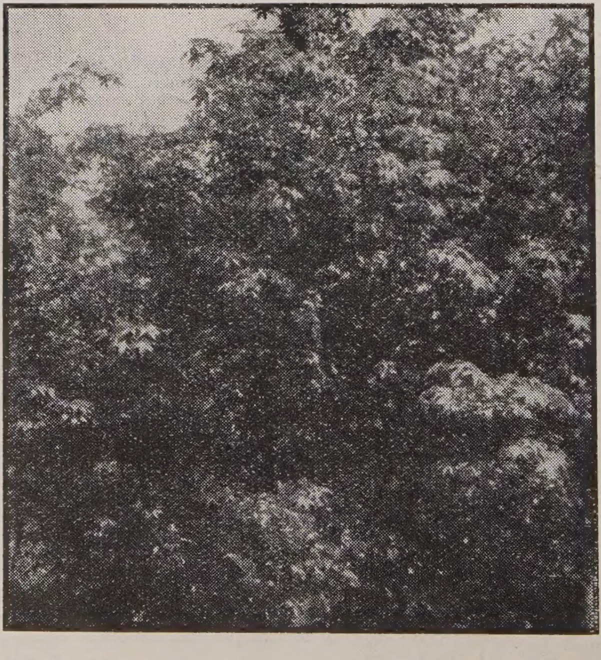
Application of Research

Small-scale spraying with D.D.T. of hedges and plants which attract queens in spring has already been advocated. The discovery that oaks and certain large hedges also attract queens in great numbers at this time led to preliminary power spraying trials with D.D.T. The success of these showed the value of such a control measure. Next spring a power spray unit will be used to spray D.D.T. on trees and large hedges in the Waikato which attract queen wasps. The trials will be under the control of the Horticulture Division and will serve as a model for operations in other districts.

Honey-dews do not usually attract bees, particularly when sources of nectar are available. In only 2 instances were bees observed collecting honey-dew from oak trees, and on those occasions their numbers were few and losses caused by spraying would have been negligible. The spring was abnormally wet and cold, and the lack of usual sources of nectar would tend to drive bees to search for alternatives. The fact that even under such conditions honey-dews were so unattractive to bees indicates that large-scale spraying, if conducted with reasonable care, should be a safe measure of control. Oak trees should not be sprayed until late spring, when their attractiveness for queen wasps is greatest; at this time many sources of nectar are available to bees.

In the conduct of the experimental power spraying, apiarists' interests will be watched carefully. This control measure is not recommended at present unless carried out under the supervision of officers of the Department of Agriculture.

The heavy showers common in spring tend to wash off sprays and, to make them still more effective, 4oz. per gallon of 50 per cent. D.D.T. dispersible powder will be used for large-scale spraying.



One of the small maple trees to which queen wasps were attracted by sprays.

The marking of queens has shown that they tend to keep returning to honey-dew at intervals for long periods, a habit which makes a D.D.T. spray particularly effective. On one occasion a queen wasp attracted to a spray was captured and marked; it was released a mile away in the centre of Hamilton, but despite the intervening river was observed on the same spray 9 days later.

Attraction of queens by sprays: Experiments will be carried out next spring in which the glucose-sucrose-dextrin spray or a similar one incorporated with D.D.T. will be used to attract and kill queens in districts where sources of honey-dew are uncommon. Artificial sprays of this nature cannot compete against natural honey-dew which is continually being renewed and is available over long periods. In the Hamilton area so much natural honey-dew is produced that the use of such sprays should not be necessary. The value of these artificial attractants mixed with D.D.T. will be estimated by spraying plants with them and keeping a constant check on the number of wasps attracted and killed on successive days.

Attraction of workers: In late summer when worker wasps become a nuisance their control by the use of sprays will be attempted. It is possible that workers may be attracted by honey-dews on trees and plants as are the queens, in which case power spraying with D.D.T. would be effective. The attraction and poisoning of the workers by selective sprays incorporated with D.D.T. will also be the subject of experiments.

New insecticides: Trials of such of the newer insecticides as are available will be made. It may be possible to discover one which kills or incapacitates queens and workers almost immediately. Though D.D.T. is satisfactory as a killer, it has the disadvantage that wasps usually are able to fly some distance before dying from its effects. An insecticide which killed quickly would allow counts of dead wasps to be made and demonstrate visually the value of such control measures.

D.D.T.-treated lures: In autumn queen wasps frequently hibernate in old sacks, cow covers, and similar quarters. The spraying of these with D.D.T. and their disposal in suitable places is recommended as a valuable means of control. The spraying of likely natural hibernation sites with D.D.T. is also a useful measure.

It must be strongly emphasised that, however effective these new methods of control may be, the destruction of nests and hibernating queens is as important as ever and should not be neglected.

Acknowledgment

The authors wish to acknowledge the co-operation of Messrs. J. Bateson and Son, 39 Victoria Street, Hamilton.

Dairy Farming on Irrigated Land in the United States

By N. LAMONT, Assistant Irrigation Officer, Department of Agriculture, Ashburton.

THIS article is not intended to be a comprehensive and accurate survey of dairy farming on the irrigated lands of the western States of the U.S.A., as there was no opportunity of collecting sufficient data for such a purpose during a hurried visit. The two farms described in some detail were visited as a consequence of a request to be shown typical good dairy farms of the districts, and it is probable that they are sufficiently representative to be of interest to irrigators and dairy farmers in New Zealand.

THE impression gained of irrigation farming in the western U.S.A. was that by New Zealand standards there were few livestock. Only a little more than one-tenth of the irrigated lands in the U.S.A. is in pasture at any one time, but about half the crops are lucerne or other hay crops, maize for silage, sorghum, and others grown for livestock feeding. It would seem that a substantial proportion of this stock fodder is sold off the producing farms for shipment to ranches, or even in some cases to areas of very heavy rainfall, which have difficulty in making good hay for themselves. The finishing of stock off the range-country in yards or "lots" also appeared to be common, so that the impression that dairying was a small item in irrigation agriculture in the western States is probably correct.

It would appear, too, that the bulk of this dairying is for whole milk supply, and that butter or cheese factories are comparatively rare even in dairying districts.

Dairy Farming Without Grass

The wide variety in farm practice over such a huge area as even the western half of the U.S.A. makes generalisations difficult and possibly misleading. Even in dairying some startling contrasts were seen, and probably the most startling was a milk "farm" on the outskirts of that least typical of American cities, where the novel and the bizarre are commonplace—Los Angeles. There was seen a "dairy farm" of 20 or 30 acres which appeared to be milking a few hundred dairy cows. Unfortunately, the guide did not have figures to give, but much was obvious—for instance, a beautiful little swimming pool for employees, and the complete absence of grass. Apparently this "corral" or "dry-lot" type of dairying is practically confined to the Los Angeles suburban area, and all feed is grown elsewhere and carted into the farm, presumably on the principle that feed is easier to carry than milk. Green lucerne, lucerne hay, meals, and silage are fed in yards with white-painted rails.

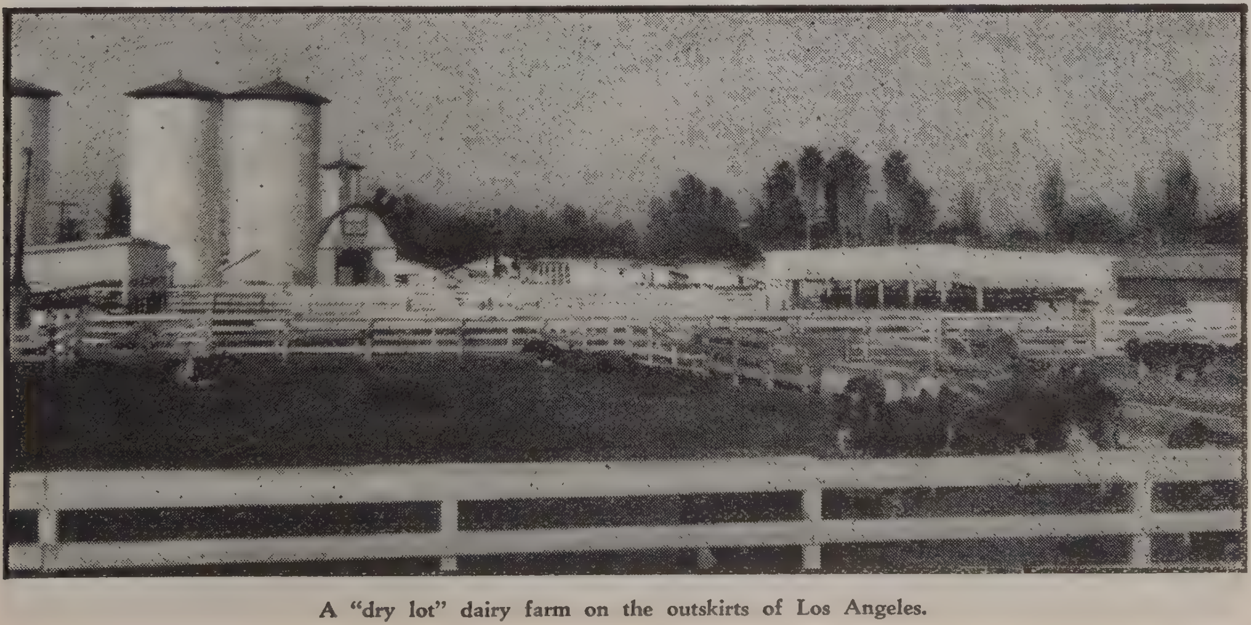
The scene was more normal in dairying districts elsewhere in the western States. In Colorado, Utah, Idaho, Oregon, Washington, and California pasture played a part in dairy cow feed supply, and many authorities believe that irrigated pastures are worthy of more attention than they are getting.

The familiar black-and-white Holsteins are probably the most popular breed of dairy cows, with Jerseys and particularly Guernseys also very common.

Carrying Capacities

Comparable figures of carrying capacities are difficult to arrive at, largely because so much supplementary feed is used, either grown on the farm or brought in. For instance, it was a shock to a pasture-proud New Zealander to be told, on asking the carrying capacity of a fine-looking irrigated pasture of cocksfoot, *Bromus inermis*, and lucerne, that it carried two and a-half milking cows an acre. A little inquiry, however, elicited the further information that, "of course, that was for the six- or seven-months season" only, and also "of course" the usual meals were fed.

The short season of many parts of the irrigated west and the fact that meals are cheap enough to be generally and freely used make direct comparisons difficult, but there is no doubt that many of the pastures seen were extremely high-producing and that the herbage produced on one acre within 12 months would provide feed for at least one dairy cow.



A "dry lot" dairy farm on the outskirts of Los Angeles.

A WASHINGTON DAIRY FARM

Upper left—The Jersey herd sire and farm buildings on Mr. E. F. Roberts's farm. Upper right—The farmer and one of his Jersey cows. Middle—Some of the herd grazing on a fine pasture which included New Zealand ryegrass. Lower—The mixture of lucerne and cocksfoot which is used for hay.

Some of Mr. Koller's high-producing herd.

Notes were taken of visits to two dairy farmers who, by American standards, were making fairly extensive use of irrigated pasture.

A Washington Farm

The farm of Mr. E. F. Roberts is near Yakima, Sunnyside, in the "Evergreen State" of Washington. The term "evergreen" refers only to the mountains and coastal strip, however, and at the Sunnyside weather station the average annual rainfall is only about 6½in. The average mid-winter month's temperature is 30 degrees F., with a minimum of —30 degrees, and the average for the midsummer month is 72 degrees, with a maximum of 108 degrees. Over 40 years the average length of the frost-free period is a little longer than four and a half months. The climate is far from mild and equable, and can probably be most closely compared in New Zealand with that of Central Otago.

Mr. Roberts's property was 32 acres in extent, and excluding sheds, yards, and buildings, he considered his productive area to be about 29 acres, subdivided into four three-acre paddocks of pasture, two five-acre paddocks of lucerne, and one three-acre and one four-acre paddocks of oats.

Buildings were by no means elaborate and, though covered shelter was available for very bitter weather, stock were normally wintered in a wind-protected but open yard.

The cows, mainly Jerseys, were milked throughout the year, averaging 26.3 cows a month. With dry cows and young stock the total on this 30-acre property was about 60 head. The milkers on official test—and this was corroborated by a local Department of Agriculture officer—averaged 537lb. of butterfat each.

Those figures unquestionably tell an impressive story of high production dairying in a trying climate, and it was gratifying to learn that one of the enthusiasms of this most able farmer was New Zealand perennial ryegrass. Mr. Roberts obtained some New Zealand seed a few years ago from a local firm, and was loud in his praise of its qualities and regretful that he was unable to secure more.

Pasture, consisting of perennial ryegrass, cocksfoot, and Ladino white clover, was in fact the mainstay of the summer feed supply, with the addition of concentrates, mainly crushed oats, some of which were grown on the property. The whole herd had daily access for the seven-months grazing season to the 12 acres of grass, which was their principal ration, and with dry stock as well it was estimated that this irrigated pasture was carrying more than 3½ head an acre for this period.

For the winter period of five months, when the cows were almost continually in the yard, the lucerne (really a mixture of lucerne and cocksfoot) produced 103 tons of hay from the 10 acres; half of the oats were made into hay and the other half threshed to yield 137 bushels an acre. In addition, a varying amount of hay and oats was bought—the previous year about 15 tons of lucerne hay and 10 tons of oats. Mr. Roberts said he expected to spend about 2000 dollars each year on brought-in feedstuffs. His gross income during the past few years had reached more than 10,000 dollars a year.

A feature of Mr. Roberts's management which seemed less general in the western U.S.A. than in New Zealand was his regular topdressing of the whole farm with 125lb. an acre of "triple" superphosphate each year, which would be equivalent to between 3 and 4cwt. of standard New Zealand superphosphate. In addition, he has up to 500 tons of barnyard manure each year from the yard feeding, and most of that is spread on the pastures and lucerne.

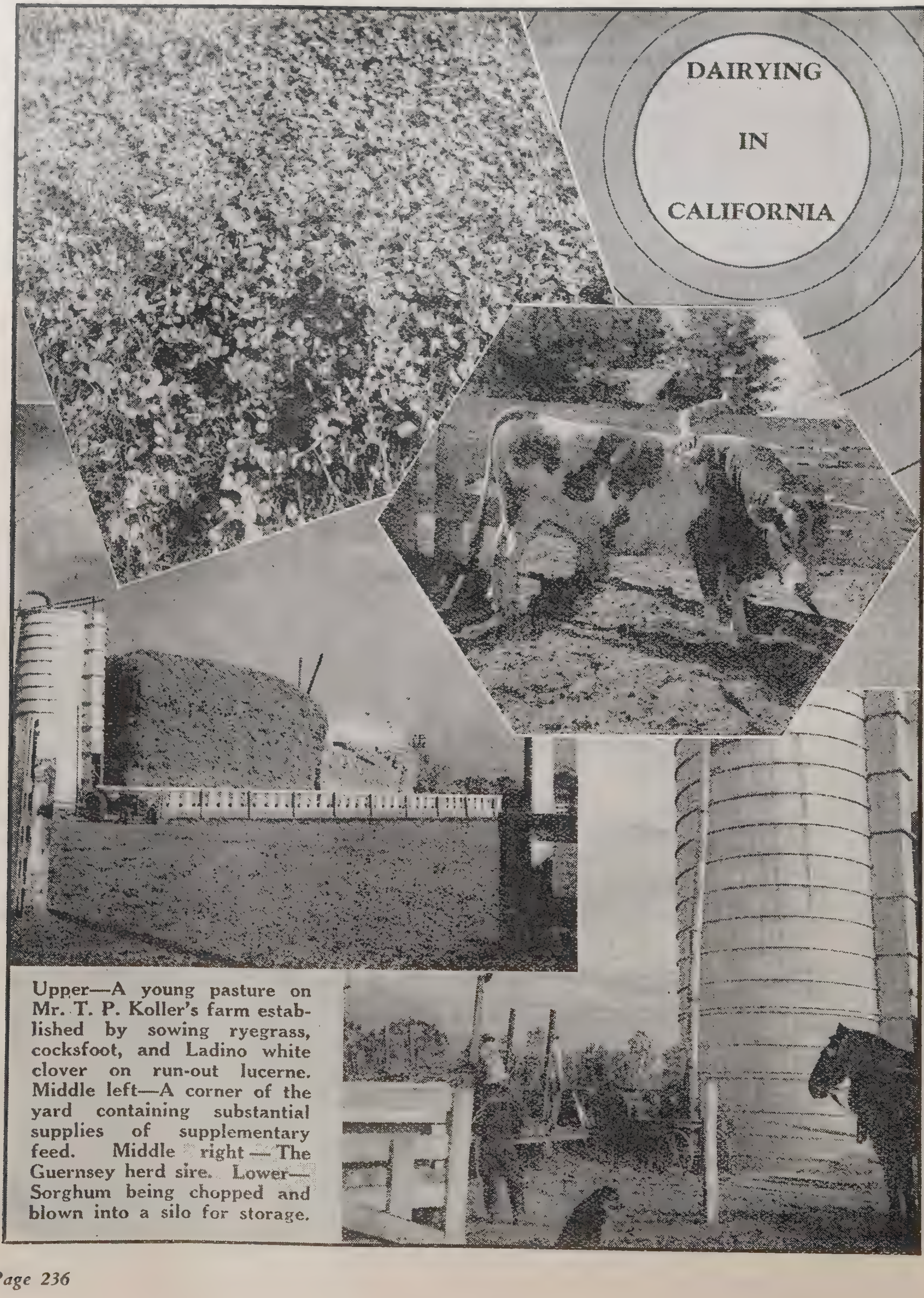
A California Farm

About 1000 miles south of Mr. Roberts's farm another town supply dairy farmer was visited—Mr. T. P. Koller, near Fresno, in the San Joaquin section of California's Great Central Valley. The climate there is also very dry, with an average of about 9½in. annual rainfall, but very much warmer. The mid-winter months' average is 45.5 degrees F. and the summer months' 81.3 degrees, with a minimum of 17 degrees and a maximum of 115 degrees. For 40 years an average of 10 months each year has been free from killing frosts.

Mr. Koller's property is of 70 acres, quite flat, and completely irrigated. It is well subdivided into about 10 main paddocks, and at the time of the visit was growing 35 acres of lucerne, 25 acres of pasture, and 6 acres of sorghum.

The stock were Guernseys, and the total carried on the property was about 140, with 62 milkers which were said to average more than 500lb. of butterfat a year.

DAIRYING IN CALIFORNIA



Upper—A young pasture on Mr. T. P. Koller's farm established by sowing ryegrass, cocksfoot, and Ladino white clover on run-out lucerne. Middle left—A corner of the yard containing substantial supplies of supplementary feed. Middle right—The Guernsey herd sire. Lower—Sorghum being chopped and blown into a silo for storage.

For at least nine months of each year pasture contributed a substantial proportion of the herd's feed supply. Because of disease, principally bacterial wilt and a virus dwarf, lucerne in this area has a profitable life of only three to four years, and pastures are established on these run-out stands by oversowing with 3lb. an acre each of perennial ryegrass, cocksfoot, Ladino white clover, and occasionally paspalum. The pastures were therefore principally ryegrass-cocksfoot-white clover, with a proportion of lucerne that decreased with the age of the pasture.

Mr. Koller's use of pasture was interesting. As a general rule cows were grazed for only about an hour and a-half each forenoon and afternoon. For the remainder of the time they were yard fed on lucerne hay and concentrates.

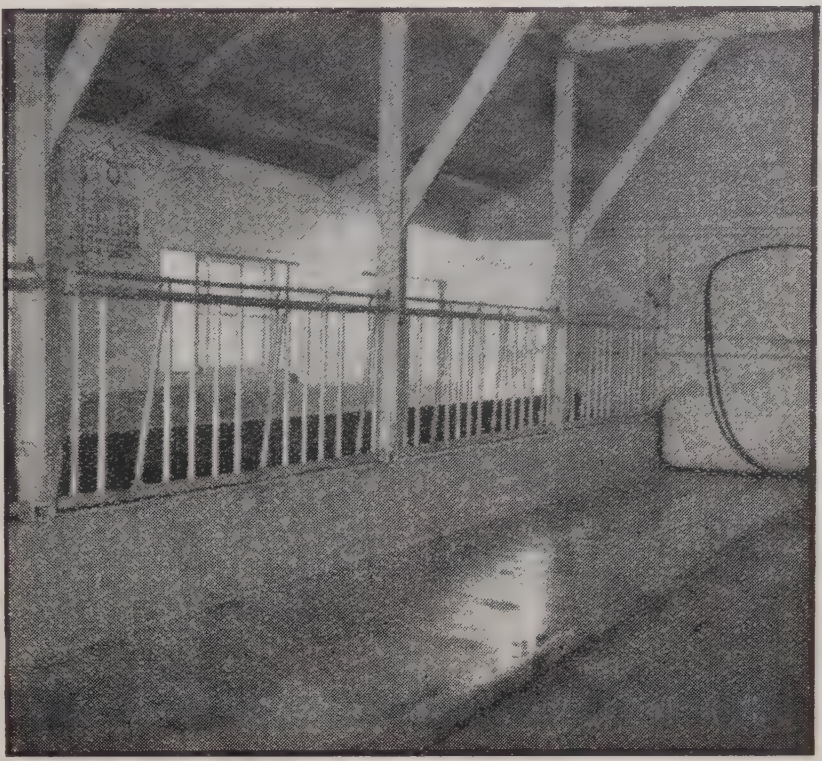
The buildings on this property were very good indeed and the milking shed was immaculate. A permanent tower silo adjoined the feeding yard, and at the time of the visit the last of the sorghum, yielding about 140 tons of silage from the 6 acres, was being chopped and blown into the tower.

For the first time Mr. Koller had used a little phosphate topdressing the previous year, but usually only barnyard manure was used.

Less Reliance on Pasture

This rather incomplete account of two dairy farms on irrigated country in the western States emphasises some of the differences between American and New Zealand practices. Even though a request had been made to see dairy farms where extensive use was made of pasture, both these farmers were relying on pasture for feed supply much less than is the almost invariable rule in New Zealand. The free use of grains and concentrates is very much a matter of economics; the price of these items in relation to butterfat price is about half of that in New Zealand. It is also usual to rely on lucerne, both green and as hay, for a large proportion of the cow's rations. Invariably, lucerne hay made in these hot, rainless areas is of superlative quality, and chaffing the hay is common, partly because it is then more easy to feed with a minimum of waste in stalls and partly because its digestibility is increased.

From the viewpoint of scientific nutrition the dairy cows seen were being much better fed than those in New Zealand, which depend on seasonal fluctuations in quantity and quality of pasture. That again is a question of price relationships, and the brief contact made with American dairying would certainly not justify drawing comparisons between the net profits obtainable under the two systems.



The interior of the spotless milking shed on Mr. Koller's property.

A crop of sorghum, used for silage, on Mr. Koller's farm.

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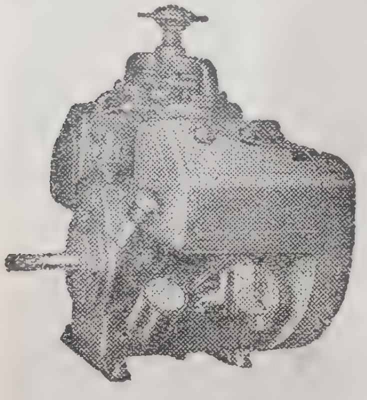

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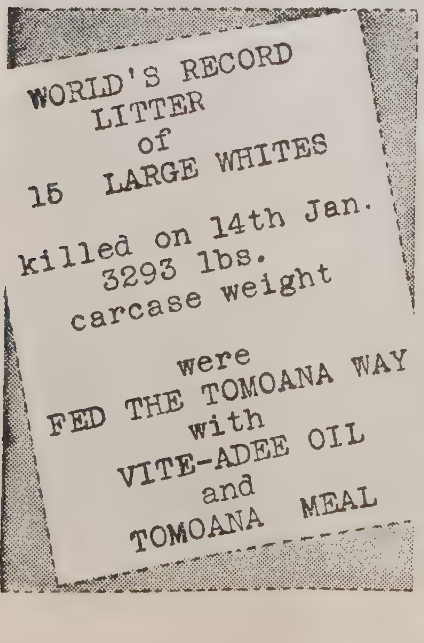

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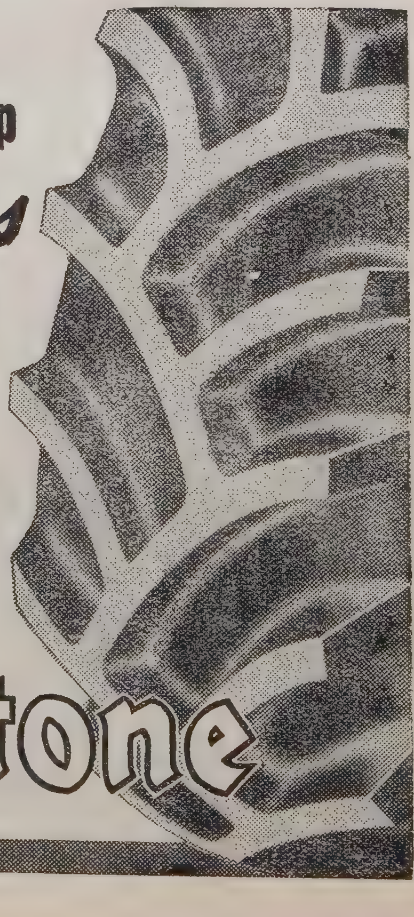


The Home Garden in April

By A. G. KENNELLY, Vegetable Instructor, Department of Agriculture, Christchurch.

SEED sowing is greatly reduced in the home garden in April. Conditions in general are more favourable for planting than sowing, but for both sowing and planting only hardy subjects should be chosen. Vegetables that can be set out now in most districts are cabbage, cauliflower, silver beet, and lettuce. Only if the soil is well drained and fertile and the aspect favourable should seed be sown.

THE harvesting and storing of crops such as onions, and, where frost is expected, kumaras should be completed without delay. In most districts potatoes, too, should be lifted as soon as convenient. Where it is not yet necessary to harvest all tomatoes the plants should be stopped by nipping out the growing points to help swell the fruit. Celery should be kept sprayed with Bordeaux or suitable Government certified fungicide to control leaf spot. The pods of dwarf and runner beans should be kept picked before they are much more than half grown to encourage the plants to keep bearing.

Toward the end of the month crops such as carrots and beetroot can be lifted and stored if space is lacking or if the ground is liable to get wet. Leeks should be kept earthed up, and where it is ready celery can be earthed up or blanched with boards or paper. Ground should be cleared of the refuse of recently-harvested crops, and vacant areas dug over as opportunity offers. A green crop suited to the time of year and district should be sown without delay on ground that is not required for cropping for some months. Growing crops should be kept weeded and cultivated.

With the refuse of so many crops becoming available, the compost heap should now be requiring attention. A new heap or section will probably have to be built and the old one turned.

Though generally the season of growth for tender and half-hardy crops such as melon, marrow, pumpkin, cucumber, and tomato is finished, steady growth can be expected from hardy plants such as the cabbage family, leeks, silver beet, and spinach. Few kinds of vegetables should be sown in the open even in favourable districts, though hardy, quick-maturing vegetables such as spinach and radish can be sown in most well-drained soils that are not too cold. In some districts an early sowing of broad beans and peas can also be made.

[*Green and Hahn Ltd. photo.*

The cutting down of asparagus fern should not be deferred once the foliage begins to turn yellow, as otherwise the seed will ripen and fall and seedlings may establish to the detriment of the bed.

[*Green and Hahn Ltd. photo.*

It is important at this time of year to keep the pods of beans picked while they are young and tender. If they are allowed to develop fully, production will very quickly decline.

Asparagus

The asparagus bed should be kept free from weeds, but it is not advisable to cut down the top growth until the foliage begins to turn yellow through the onset of cold autumn weather. While the tops are green the plants are manufacturing plant food and building up crowns from which strong spear growth can be cut next spring. If, however, cutting is deferred too long, the seed ripens and falls, and the young plants which come up the following season are often unnoticed and become established to the detriment of the bed. Fern growth can be cut with garden shears or with a sharp knife and the bed should be weeded afterward if necessary. This is a good time to apply a dressing of compost or clean soil mixed with well-rotted farmyard manure.

Carrots

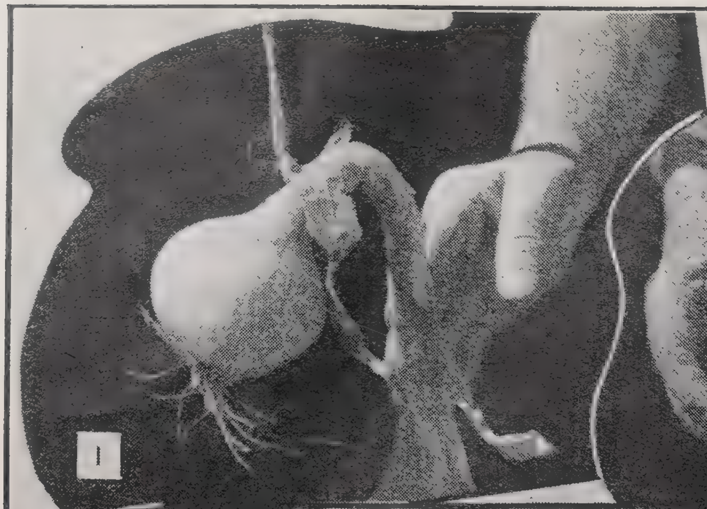
Autumn sowing of carrots is not advisable where winter conditions are cold enough to check growth severely, but on light, well-drained soils in favourable situations a small sowing of short or half-long carrots can be made in many districts in April.

Sowing on ridges or in a raised bed is usually an advantage. The rows on a raised bed need not be more than about 6 to 9in. apart and for convenience of harvesting the bed itself should not be wider than 4ft. It is usual to harvest the roots before they are fully mature, and thinning should therefore be unnecessary, though weed control should be rigorous. Good varieties for sowing now are Scarlet Horn and Early Gem.

Kumara

Unless it is intended to use kumaras fairly soon, digging should be completed before frost cuts the tops. Kumaras are difficult to store, as they require a pre-storage curing period (during which they should be subjected to fairly-high temperatures and humidity) which is beyond the means of most home gardeners. After curing, the storage temperature should not fall below 50 degrees F. Great care must be taken in handling and during harvest, as wounds rarely heal unless conditions of humidity and temperature are ideal. The tops should first be cut and the tubers should be dug very carefully with a fork. It is usual to leave them out for a few days (covering them at night) before putting them in store.

A SIMPLE METHOD OF STRINGING ONIONS



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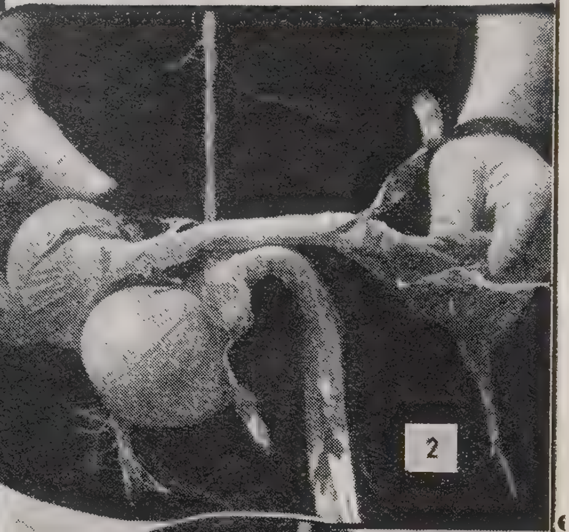

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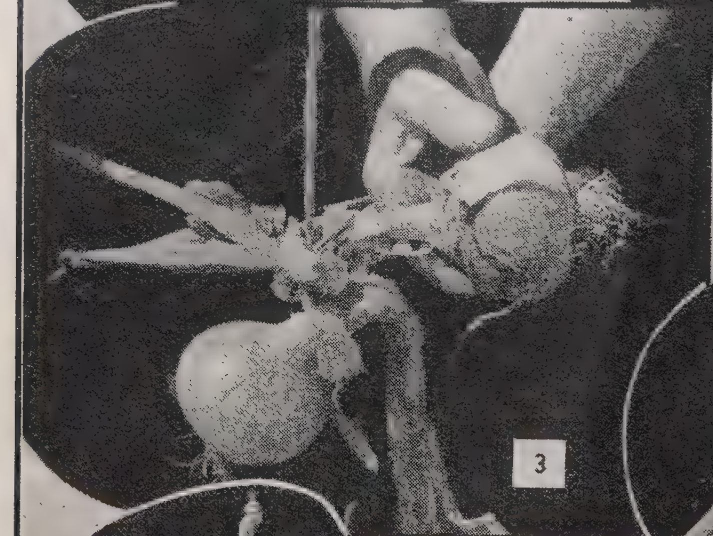

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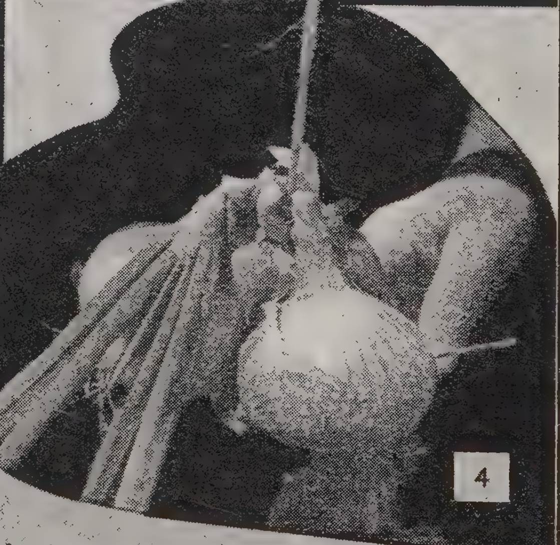

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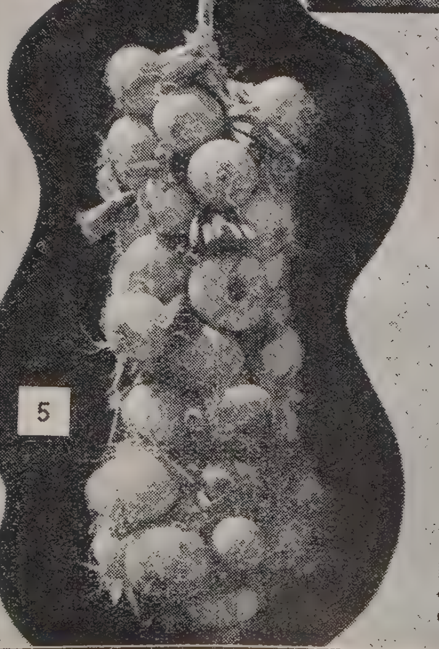

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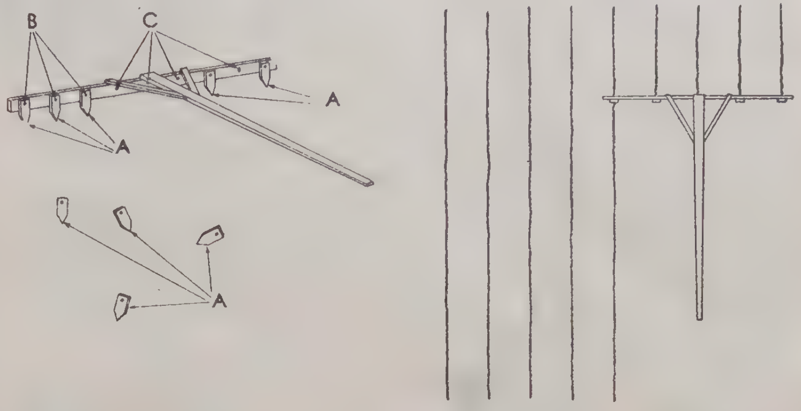
This simple method of stringing onions, described by D. K. Pritchard, formerly Instructor in Vegetable Culture, Wellington, in the March, 1947, issue of the "Journal," is reprinted here as the result of many requests for its republication.

After fastening the first bulb the following operations are simple:—Each bulb is held in the right hand; the tops are passed behind and with the left hand brought completely round the string while the bulb in the right hand is quickly placed on top of them. This continues until the string is completed. Binder twine doubled and twisted is quite suitable to hold 25 to 30lb. of onions. The two loose ends are knotted, then fastened securely to a bulb with a good stout "neck," as shown in Fig. 1.

Fig. 1—First onion fastened at the end of the string. This should be done securely, as it is the basis of the operations which follow. Fig. 2—The proper method of starting the "locking" process. Fig. 3—The bulb and the tops have been passed almost completely round the string. Fig. 4—The tops have been passed under the bulb, which has been placed on top of them, thus completing the "locking" operation. Fig. 5—The completed string ready for hanging in any outbuilding where there is always a good air circulation.

[Photo News Ltd. photos.

AN EASILY-MADE ROW MARKER



A row marker with adjustable teeth suitable for use in large home gardens for marking out rows for setting out cabbages, cauliflowers, leeks, onions, silver beet, lettuce, etc. The blade can be made to whatever size may be necessary; the one illustrated is 4ft. 6in. long and the adjustable teeth are designed to mark 9 rows 6in. apart, 5 rows 1ft. apart, 3 rows 1ft. 6in. apart, or 3 rows 2ft. apart. Left: A—Teeth. B—Bolts. C—Bolt holes at 6in. intervals. Right: The marker set to mark 5 rows at 1ft. intervals.

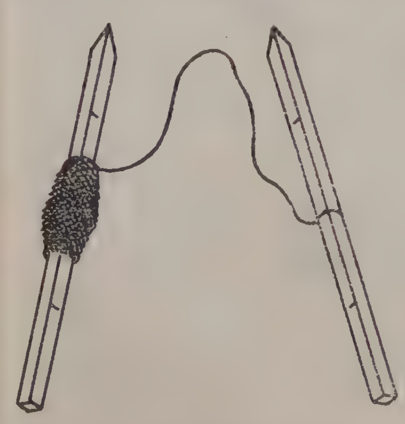
Marrows, Pumpkins, Squash

Weekly applications of liquid manure preferably made from organic material such as farmyard manure will usually be an advantage in helping to swell the fruits of marrows, pumpkins, and squash in districts where at most only minor frosts are expected. It is a good plan to lift the swelling fruits on to a slab of wood or sheet of glass to keep them off the ground, as rotting caused by insect attack or mechanical injury is common in late autumn. Where moderate or heavy frosts are usual the fruits should be harvested if they are required for storing, though paper pegged over the fruit or held down with stones will usually give protection against up to 6 or 7 degrees of frost.

The fruit of marrows for immediate use should be cut when young, preferably before the skin hardens so that it cannot be broken easily by the thumbnail. Ten to 12in. is a good size; the bigger marrows become the less flavour they have and the greater becomes the relative volume devoted to seed. Marrows for storage should, however, like pumpkin and squash, be allowed to mature as far as possible. Fruits for storage should be harvested with great care and stored in a dry, frost-free situation. In some districts harvested fruit can safely be put on boards or straw under a hedge, but usually a dry, well-ventilated shed is preferred, because if they are left in the open, they may be eaten by rats.

Onions

As the weather after April usually becomes progressively less favourable for drying the bulbs, it is advisable to complete the harvesing of onions and also of shallots if they are not yet gathered. Only sound, well-formed bulbs which have been properly cured should go into long storage; others should be put aside for more immediate use. Small quantities can be strung or stored in open-mesh bags in a cool, ventilated shed or cellar, but because of the injury which often results when there is a heavy weight of onions in a bag, it is advisable when storing considerable quantities to use specially-made slatted storage crates or store the onions on slatted shelves. Onions should not be exposed to direct sunlight during storage, as it may promote early growth. If it is necessary to store them outside, a dry, sunless position where there is good air draught is desirable. The onions should be covered against the rain and preferably placed on a structure far enough above ground to enable air to circulate under them.



Pegs on garden lines are useful for marking row spaces. The intervals, preferably 6in., should be marked by sawcuts or paint on the pegs, which should be about 2ft. long.

Autumn Sowing

Though the autumn sowing of main-crop onions is a fairly general practice in the North Island, it is rarely done in southern districts. In most districts late March or early April is considered the best time for autumn sowing. In southern districts the onions are not usually thinned, but are kept cultivated and grown on until about November or December, when they are used as "thick necks" without being encouraged to form large bulbs. In most northern districts, however, the plants are lifted in early spring and set out in rows 12 to 15in. apart with the plants 4 to 6in. apart in the rows.

Autumn sowing in some districts is rather precarious and where winters are severe success depends to some extent on the season. Early frost will sometimes "lift" and damage late-sown crops, whereas if the seed is sown too early or if a long period of mild weather precedes a very severe cold period, the plants sometimes run to seed before they have developed adequately.

Though this is true of autumn sowing in general, in the north, where the winters are less severe, the risks are much less and autumn sowing and transplanting of the main crop are fairly general. The prevalence of mildew in some northern districts in summer is an additional reason why autumn sowing is preferred there, as autumn-sown plants are usually well developed before the attack becomes serious.

For autumn sowing the ground should be deeply cultivated and broken down to a fine tilth. It should be gently firmed, but care should be taken where the soil is heavy to avoid firming it too much, as the heavier soils tend to consolidate excessively where they are subjected to frequent winter rains.

If well-rotted stable or farmyard manure is available, it should be incorporated some time before the final preparation of the soil is begun. The best use can be made of such manure by adding to it about a thirtieth of its weight of superphosphates and applying it to land on which the crop is to mature. If keeping-quality onions are required, it is not advisable to apply excessive quantities of organic manure in spring, as the bulbs may be stimulated into excessive leaf growth and weed seed is liable to be troublesome.

Few home gardeners are likely to have much farmyard manure and should use available compost plus a complete fertiliser applied at the rate of about 3 to 6oz. per square yard. Because of the great variation in soils and their condition throughout New Zealand only local experience and knowledge can indicate fertiliser requirements, but if soil conditions and fertiliser placement are correct, it seems difficult, judging by experiments that have been carried out, to over-fertilise the onion. In general a fertiliser highest in phosphoric acid but containing a liberal amount of potash and a smaller amount of slowly-available nitrogen will give excellent results. The phosphoric acid and most of the nitrogen for early-planted crops can be supplied best by finely-ground bone meal. The potash can be supplied by wood ashes or by muriate or sulphate of potash.

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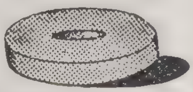

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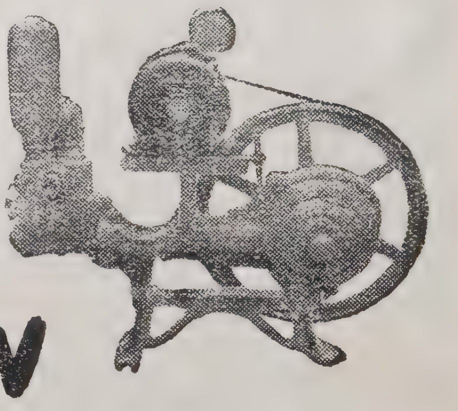

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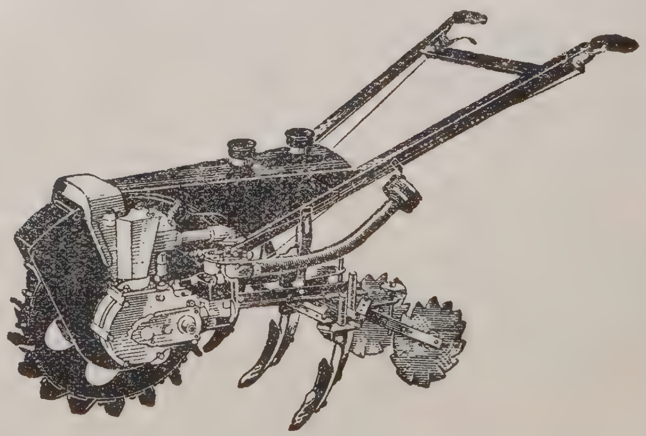

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The onion is very sensitive to excessive soil acidity, and if the soil has not recently been dressed with lime, at least 2 to 3oz. of carbonate of lime should be applied per square yard.

Varieties

Onions may be white, yellow, or red and vary in shape from flat to medium, deep oblate, oval, or round. In general, however, the many varieties can be classified most conveniently as follows:—

Early Maturing: Examples are White Portugal or Lisbon, Early Golden Globe, Silverskin, Odourless, and Crystal Wax. In general, though some are fair keepers, these onions are mild and suitable for sowing for bunching as "spring" onions or for pickling or for quick bulbing and early use.

Large or Giant: Ailsa Craig, Giant Rocca, and Prizetaker are examples of this group, in which onions may weigh 2 to 3lb. and in exceptional cases even more. They are not good keepers, but generally have a mild flavour.

Long Keepers: These are medium-sized onions. If too much nitrogenous manure is not applied during growth, if proper precautions are taken against diseases such as neck rot and "bottom rot" by practising hygiene and rotation, and if the bulbs are handled with care and stored in hygienic surroundings at low temperatures, good strains of these varieties should last from late autumn until the new season's early crop comes in. Examples are Turbott, Pukekohe Long Keeper, and Brown Spanish Long Keeper.

Cabbage plants for spring cutting can be set out now. The soil should be fertile and well drained and the aspect favourable or the plants are likely to be severely checked during the winter months.

Potatoes

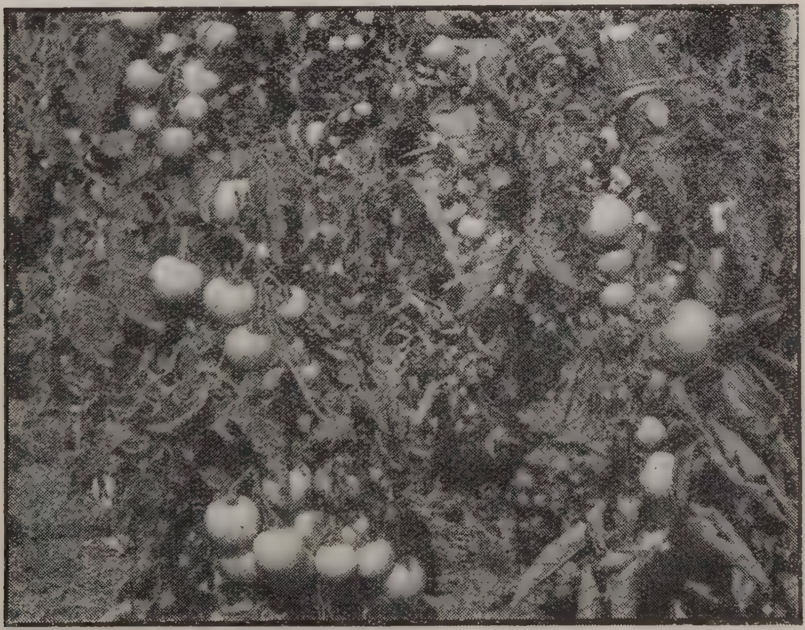
Most potato crops should now be mature or nearly so, and this can be judged by the top growth. If the top is healthy and vigorous, growth will continue and digging is therefore best delayed unless tubers are wanted at once. Top growth should be watched closely, because unless the tubers are to go into immediate consumption or the land is required for another crop, it is not advisable to dig until the tubers are mature. If potatoes for keeping are dug in an unripe state, there is likely to be heavy loss in storage.

Potatoes are mature when the skin of the tuber is firm and does not rub off easily. Rain or a slight frost or two usually help firm it, which enables the potatoes to be handled with less likelihood of bruising. Where the tuber moth is not troublesome it is sometimes a good plan to leave the tubers on the ground for a day or two before bagging or storing them.

There is rarely any advantage in leaving the crop undug after it is mature. If the weather becomes wet and warm conditions prevail, second growth may occur after the first growth has died down; the tubers may develop knobby outgrowths or small useless tubers may grow at the expense of the large ones. Insects such as slugs, grass-grubs, or wireworms often cause damage and holes may be eaten in the tubers and rots result. If the tuber is still growing, it may endeavour to grow round the point of attack or source of irritation, and the knobby outgrowth produced (not unlike those resulting from second growth) makes such tubers very wasteful in preparation for the table. Finally, potatoes left in the ground are rarely weeded, and if couch grass becomes established, the stolons often grow through the tubers and thus cause unnecessary waste in preparation for the table.

Spring Cabbage

If early spring cabbage is desired, sturdy, well-grown plants with good root systems can now be set out. In most districts a sheltered situation is advisable, and as a maximum of sunshine is required, a northerly aspect is desirable. The ground should be well drained, and if the soil is heavy and likely to be wet for considerable periods, the plants should be set out on ridges, or if only a small area is used, a raised bed can be made.



Where more than a few degrees of frost are expected all fairly mature tomatoes should be gathered. Sound green fruit should be stored under conditions that enable ripening to take place without collapse or softening.

THE HOME GARDEN IN APRIL . . .

The soil should be rich in organic manure and in most home gardens heavy dressings of organic manure such as farmyard or stable manure, compost, or moderate dressings of fowl manure are advisable. If the soil has not been limed recently and there is a risk of its being acid, a dressing of 3 to 4oz. of lime per square yard is advisable. Heavier dressings may be necessary on some soils in high-rainfall districts, but as the effectiveness of lime is in direct relation to the closeness of its contact with the soil particles, it should preferably be applied some time before planting. Distribution should be as even as possible and incorporation should be assisted by at least one forking over. Thoroughness of distribution is important, because there is little or no sideways spread of lime in the soil when it is left, though its downward spread is assured by the leaching action of rainwater.

Though the manurial requirements of cabbages are heavy, care should be taken to distribute fertilisers or manures evenly, as young plants are liable to be checked if the roots come in contact with too-heavy concentrations of manure. Where organic manures such as farmyard, poultry, or stable manure, old stack bottom, or compost are not available a green crop should be dug in, and, except where the soil is very rich, the organic manure or green crop should be supplemented by a complete fertiliser (containing nitrogen, phosphoric acid, and potash) at the rate of about 2 to 5oz. per square yard.

Additional side dressings of nitrogenous manures such as nitrate of soda or sulphate of ammonia are often advisable, particularly where the organic matter applied to the soil is of a strawy nature rather than sappy and well rotted and when quick, forced growth is required, as in early spring.

Popular Varieties

Flower of Spring, Jersey Wakefield, Springtide, and Early Offenham are among the quickest maturing. Jersey Queen, Enfield Market, and Charleston Wakefield are classed as second-earlies and mature about a fortnight later. Flower of Spring and Enfield Market are popular in southern districts. Good strains should be chosen.

Spring Cauliflower

The requirements of cauliflowers are similar to those of cabbage except that cauliflowers are more sensitive to adverse conditions (such as extremes of heat and cold and wetness and dryness), and if checked, they are likely to "button"; that is, form only useless miniature heads. Frost, too, will damage the curds and the injury so caused is likely to permit the entry of soft-rotting organisms. Cauliflowers should therefore be planted out only in districts where winter conditions are not too severe. In unfavourable situations planting is best deferred until late July, August, or even September. Good hardy varieties of cauliflower suitable for planting now are Walcheren and All Seasons. Cauliflower plants are obtainable from most seedsmen.

Tomatoes

Tomato plants should have been stopped by April to assist the fruit to swell and ripen, but where more than a few degrees of frost are expected all fairly mature tomatoes should be gathered. Fruit that is well coloured can be put aside for immediate use or for preserving; the remainder should be stored under conditions that enable ripening to take place without collapse or softening. Sound green fruit that is dry and fairly mature can be packed in boxes.

Fruit in the boxes should be stacked in layers with material such as clean straw or double layers of scrim between each layer. Light is not necessary for ripening, which depends on temperature, humidity, and the amount of carbon dioxide present. The boxes can be stacked one on top of another in a shed, where the temperature should be maintained at about 55 to 65 degrees F. This is somewhat lower than the ideal, but is in proportion to the comparatively-low relative humidity. Tomatoes can also be stored by wrapping each fruit in paper and placing them in a drawer or cupboard at a temperature of about 50 to 60 degrees F. or by pulling up the whole plant and hanging it in a shed.

DAIRY PRODUCE GRADED FOR EXPORT

THE following figures showing quantities of dairy produce graded for export during January and for the 6 months ended January 31, 1949, with comparative figures for the same month and 6-monthly period of last season, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER—

	Tons			Tons	
Period	Creamery	Whey	Total	Percentage inc. or dec.	Total in store at end of mth.
January, 1949	18,301	323	18,624	+ 7.678	28,492
January, 1948	16,987	309	17,296	—	35,370
Increase or decrease	+ 1,314	+ 14	+ 1,328	—	— 6,878
For 6 mths. ended 31/1/49	99,191	1,701	100,892	+ 3.893	—
For 6 mths. ended 31/1/48	95,515	1,596	97,111	—	—
Increase or decrease	+ 3,676	+ 105	+ 3,781	—	—

CHEESE—

	Tons			Tons	
Period	White	Coloured	Total	Percentage inc. or dec.	Total in store at end of mth.
January, 1949	11,005	913	11,918	+ 6.993	24,997
January, 1948	11,139	—	11,139	—	22,950
Increase or decrease	— 134	+ 913	+ 779	—	+ 2,047
For 6 mths. ended 31/1/49	56,856	2,641	59,497	+ 8.871	—
For 6 mths. ended 31/1/48	54,649	—	54,649	—	—
Increase or decrease	+ 2,207	+ 2,641	+ 4,848	—	—

If these figures are converted into butterfat equivalent, there is an increase of 4.913 per cent. in butterfat graded for the 6 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

BOOK REVIEW

"Dairyfarming Annual, 1948"

THE first annual publication issued by Massey Agricultural College for dairy farmers, this book contains the addresses and discussions at the first post-war 3-day meeting of dairy farmers held at the college. It covers a wide field of modern research work which has a direct bearing on practical dairy farming and much of which is of interest in other countries.

The following are among the articles in the publication: Mastitis Control, with Special Reference to Penicillin (J. F. Filmer), Profitable Pig-fattening (D. M. Smith), Importance of Butterfat Test in the Economy of Dairy Production (A. H. Ward), Do Calves Fed on Skim-milk Need Meal? (I. L. Campbell), Controlled Grazing for Increased Butterfat Production (C. P. McMeekan), Land Values in Relation to Guaranteed Price (W. E. Scott), Dairy Research Institute and the Farmer (H. R. Whitehead), Pastures for Dairy Farms (E. B. Levy and P. D. Sears), Veterinary Council and Clubs (A. A Leslie), Pig Housing (L. L. Marsdon), Proven Sires and A.I. in Herd Improvement (C. P. McMeekan), Economy of Labour on Dairy Farms (G. A. Hansen), Grazing Habits of Dairy Cows (J. J. Hancock), Profitable Field Drainage (A. W. Hudson).

The book can be obtained from the Registrar, Massey Agricultural College, Palmerston North. 10s.

BUTTERFAT PRODUCTION ON PUWERA FARM

In the article "Settlement of Returned Servicemen on Land Development Blocks" in the February issue of the "Journal" an error in the caption beneath the block on page 165 caused the production of butterfat from 83 cows grazed on 170 acres of a Puwera farm in 1947-48 to appear as 2200lb. The figure should have been 22,000lb.

Cotton Thistle

By S. H. SAXBY, Agrostologist,
Department of Agriculture, Wellington.

THOUGH by no means a recent introduction in New Zealand, cotton thistle may possibly become of importance to some farmers owing to its spread in recent years in the Lowburn district of Central Otago. Except for the flower heads, which are occasionally eaten by horses, and the seeds, which are relished by poultry, the plant is not eaten by stock. Cotton thistle, like many other thistles, is harmful because, being unpalatable, it crowds out useful plants. It seeds freely and in some instances areas of up to 10 to 20 acres have been extensively, though not entirely, covered with it.

COTTON thistle (*Onopordon acanthium*) is called by several different names—downy thistle, silver thistle, woolly thistle, Scotch thistle—in various parts of the world where it is present, the commonest name being Scotch thistle. That name has been applied to it because it is considered to be the heraldic thistle of Scotland. However, it should not be confused with the widely-distributed plant commonly known as Scotch thistle in New Zealand.

Description of Plant

Cotton thistle is an annual or biennial which grows from seed shed in the autumn. It remains in the rosette stage during the winter, and, when behaving as an annual, produces its flower stalk during the following summer. Flowering takes place about Christmas, after which the seed is formed and the plant dies in the autumn. In size the plant varies greatly according to the conditions under which it is growing. In poor, dry situations it reaches a height of about 1ft. with a comparatively-small spread of leaves; on fairly-good land it grows to a height of about 4ft., with a spread of 2 to 3ft.; and under very favourable conditions plants may grow to a height of 6 or even 8ft., with a correspondingly-wide spread of leaves.

The flowering stems have numerous leaves, which come off the stem at a fairly-acute angle, but the large leaves droop near the end. On the stems and between the leaves there are four leaf-like wings which are evenly spread round the stem. The most striking feature of the plant is the abundant, web-like mass of white hairs which cover the leaves, stems, and wings. Even the flower heads are abundantly covered with these hairs almost to the tops of the spines. The dense covering of hairs gives the whole plant an intense white colour—with a faint background of green underneath—which is intensified when the whole plant loses its green matter and dies in the autumn. The flowers are purple and are borne singly on branches coming off the main stem, while on the edges of the irregularly-lobed leaves and wings are many sharp, yellow spines or prickles.

Cotton thistle colonising on a rabbit warren near Lowburn.

On thin pastures cotton thistle is able to increase, and it smothers out useful grasses.

Distribution

Cotton thistle is of European origin, but has been spread to other countries either deliberately or accidentally.

In a contribution on "Plants Naturalised in the County of Ashburton" ("The Transactions of the New Zealand Institute," vol. 36, page 214), W. W. Smith states: "During the last five years of more or less cool weather at all seasons ——— and *Onopordon acanthium* have dispersed rapidly. In the autumn when the seed is ripe the plants are visited by large flocks of goldfinches who attack the flower heads and scatter the seed in all directions." Hilgendorf, in "Weeds of New Zealand" (1926), refers to cotton thistle as: "A garden escape in several localities." G. M. Thomson in "The Naturalisation of Animals and Plants in New Zealand" refers to it as: "Early introduced into the country but first recorded for Ashburton by W. W. Smith. . . . "

While its complete present distribution is not known, cotton thistle has been reported recently from several districts in the South Island. Patches of various sizes have been seen at Dunsandel, Sunnyside, and in the vicinity of Kurow, but there have been no reports of its having become aggressive.

Cotton thistle is reported to have been present in the Lowburn district, near Cromwell, for the last 30 or 40 years, but in recent years it appears to have spread considerably and is now found at Bannockburn, Roaring Meg, Gibbston, and in the vicinity of Tarras and Cromwell. It is possible that it is more widespread. Cotton thistle is, however, most abundant in the vicinity of Lowburn where it is plentiful on roadsides and in some non-irrigated pastures. Its manner of introduction to the district is uncertain, but it is possible that it was introduced deliberately as an ornamental garden plant. It is occasionally grown in gardens, partly because of its ornamental nature and partly because of its historical association with Scotland.

Habitat

Cotton thistle is essentially a weed of waste ground and loose soil on poor, open pastures. In the Lowburn district it is plentiful on roadsides where the soil has been dis-

COTTON THISTLE . . .

turbed by machinery such as graders and by travelling stock, and it comes in readily on rabbit warrens, road cuttings, slips, and loose shingly hillsides. On good pasture, such as one obtained by irrigation, cotton thistle rarely secures a hold.

In other countries it apparently grows under similar conditions. In "British Wild Flowers in Their Natural Haunts" (Vol. 4, page 38) A. R. Horwood states: "The cotton thistle, where it is a native, is a plant of dry places, and elsewhere it is merely a casual found in waste places, in gardens, and where it has been sown by men consciously or unconsciously like many other plants. . . ."

Cotton thistle growing on a roadside.

Control

For many years accessible patches in the Lowburn district have been controlled to some extent by mowing before flowering. Other odd plants have been killed by chipping them off at ground level with a shovel. It is intended to conduct trials with various weedkillers such as the hormone type and sodium chlorate. Most thistles are very susceptible to the former and it is likely that cotton thistle will also be susceptible.

Though cotton thistle has been present in the Lowburn district for many years and appears to be spreading over a fairly-wide area there and in adjacent localities, it is unlikely to spread into any good pastures.

However, as there are many districts in New Zealand where it would almost certainly thrive if introduced, a watch should be kept for the weed, which should be eliminated as soon as it is recognised.

IRRIGATION OF TURNIP CROP

By W. A. McKELLAR, Fields Instructor,
Department of Agriculture, Ashburton.

AFTER his experience two years ago in successfully irrigating his soft turnip crop, Mr. R. W. Prebble, of Winchmore, a farmer on the Ashburton-Lyndhurst Irrigation Scheme, again irrigated this crop during the 1947-48 season with quite good results. Though the irrigated crop was not a heavy one compared with crops on this land in normal years, it nevertheless provided a considerable amount of winter feed as a result of the one application of irrigation water.

WEATHER conditions in the summer of 1947-48 in the coastal area of Mid-Canterbury were very dry, with rainfall below average for November, December, January, and March, and just above average for February. Individual falls in the first four months of 1948 were small and the rain-water was soon lost to plants through evaporation.

The average crop of Green Globe soft turnips in the Winchmore district in the 1947-48 season was very poor and suffered severely from the dry weather and attacks of the diamond-backed moth and white butterfly. By the end of February most of the leaves had withered and died, while a considerable number of the smaller bulbs rotted and eventually died. Many crops were fed off well before the winter in order to obtain at least some feed from the turnips before they were a total failure. Occasional showers enabled the larger bulbs to grow new leaves and survive. The crop was at this stage when Mr. Prebble decided to irrigate his turnip field to carry the crop through to the winter for sheep feed. The crop was sown on good ground which the previous year had grown a 50-bushel wheat crop. One ton of lime was sown on the paddock after the wheat and in mid-December the turnips were drilled through every coulter, on the flat.

The crop was wild-flooded from a ditch along the top and one side of the field for one day (March 13) only. At least a third of the 16-acre field was not watered, which provided a control for experimental purposes. The field has a fairly even fall of about 6in. per chain, which prevented waterlogging of the crop. Against the gorse hedge at one end of the field where the surplus water lay for more than one day there was a complete drowning out of about ¼ acre. On the balance of the irrigated area the turnips grew well right up to the time of feeding off in mid-July. Several plots were weighed on June 17 and yielded 9.7 tons per acre from the non-irrigated areas, compared with 14.8 tons per acre from the irrigated areas. This 53 per cent. increase in yield was brought about by the expenditure of £2 for water and that charge, spread over the 10 acres irrigated, therefore amounted to 4s. an acre.

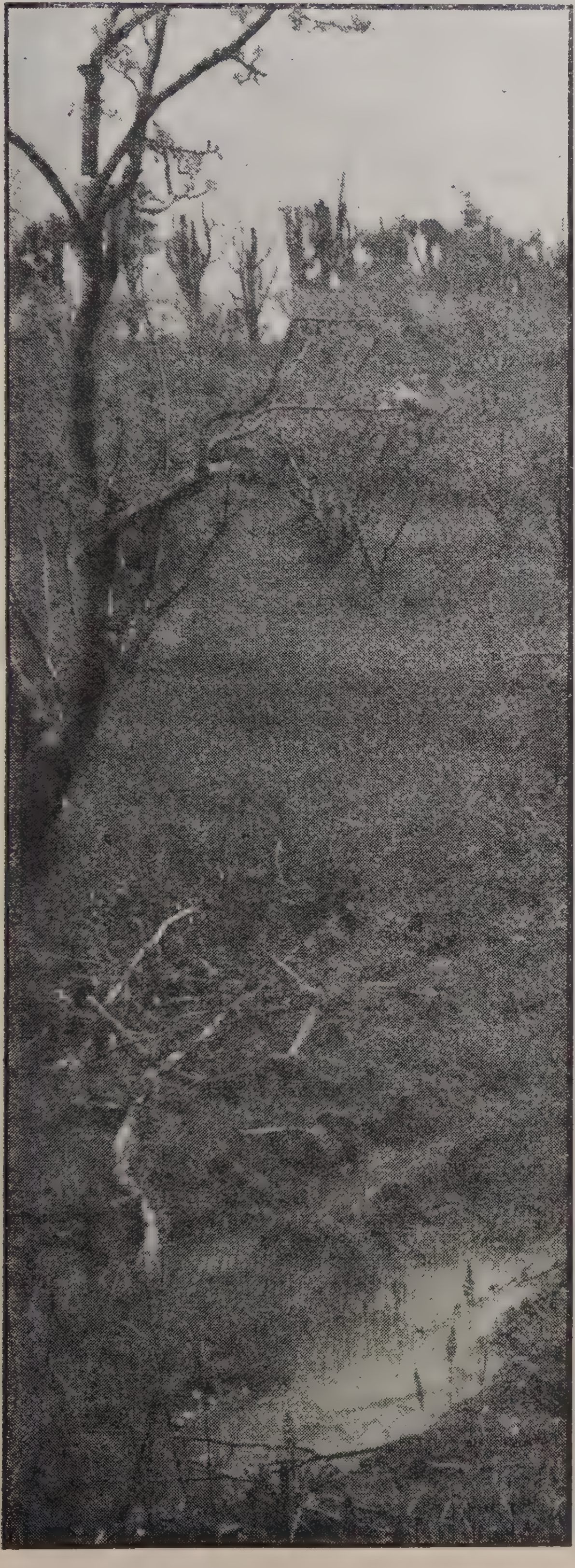
The sheep showed a preference for the irrigated bulbs over the tougher, non-irrigated ones.

It is possible that had the crop been irrigated a few weeks earlier, with perhaps a second watering about a month later, a much heavier yield might have been obtained. At the same time, however, the return for the small charge for irrigation water appears well worth while.

In this case the results from applying water were certainly very promising, and indicate that further trials to determine the most suitable time to apply water and the optimum number of applications for maximum growth are very desirable. Furrow irrigation of turnip crops in this district also deserves investigation.

Sheep feeding on break of irrigated turnips.

Importance of Soil Drainage in Orchards



[Sparrow Industrial Pictures Ltd. photo.

FRUIT trees will not thrive and fertilisers will not give the greatest benefit in soil which is waterlogged, like that shown in the illustration on this page, so the adequacy of soil drainage is an important factor in the success of an orchard. In this article W. S. Kemp, Horticultural Inspector, Department of Agriculture, Auckland, describes different types of drains and methods of using them in orchards.

IF water remains on the surface in an orchard for several hours after rain stops falling, or the topsoil is wet and soggy, some system of drainage is necessary. The symptoms may be apparent on a small area or over the whole orchard, but, however slight, they should be rectified as soon as possible. Such conditions usually occur in fine-textured clay soils where the natural spaces between the soil particles are too fine to allow rapid passage of water Flats or areas with only a slight fall are most likely to need draining, but if the soil is very retentive, even areas with a good fall will benefit from drainage.

If there is even slight movement of this surplus water, trees will live, but where water stagnates no fruit tree will remain alive.

When drainage is insufficient, trees show such signs as stunted growth and a stag-headed appearance, with small unhealthy leafage and fruit which fails to size.

Soil Water Movement

Soil may be likened to a sponge in structure, having both large and small pore spaces. The smaller pore spaces retain moisture through the force of capillarity, just as blotting paper absorbs moisture, while the larger ones allow water to pass under the influence of gravity. No system of drainage will remove the water retained in the smaller pore spaces, from which source the tree roots draw their supplies.

Though gravity causes water to be drawn vertically downward, horizontal movement occurs only when, under this influence, movement sideways becomes necessary to adjust water levels in the soil. The point at which this horizontal movement takes place is known as the soil water table, and the function of a drain is to provide a free outlet for excess soil water at a depth which will cause the lowering of the water table much more rapidly than would be possible without artificial aid. Open-textured sandy and gravelly soils have a high proportion of large pore spaces and, provided that an outlet exists, will readily permit the escape of excess water after rain In clay soils, where the soil particles are very fine, the natural soil channels are inadequate for the quick removal of surplus water, which is retained by the small pore spaces, thus quickly building up the water table until the soil is waterlogged.

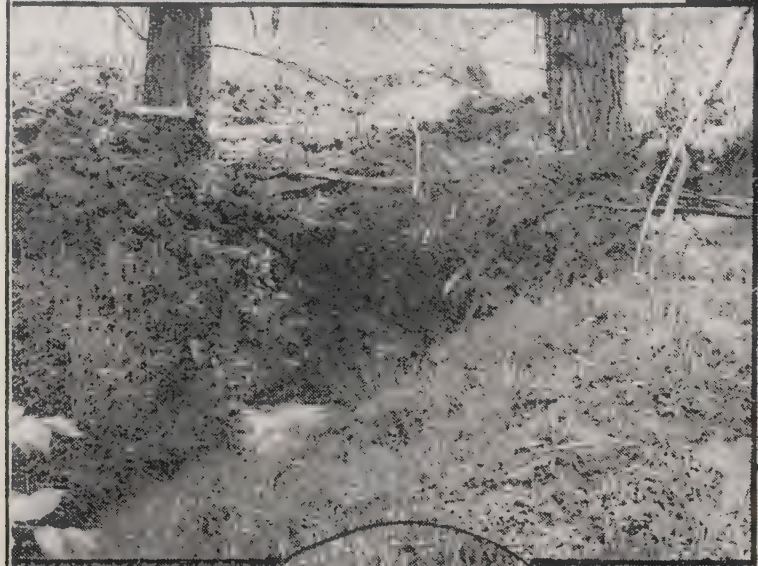
Benefits of Drainage

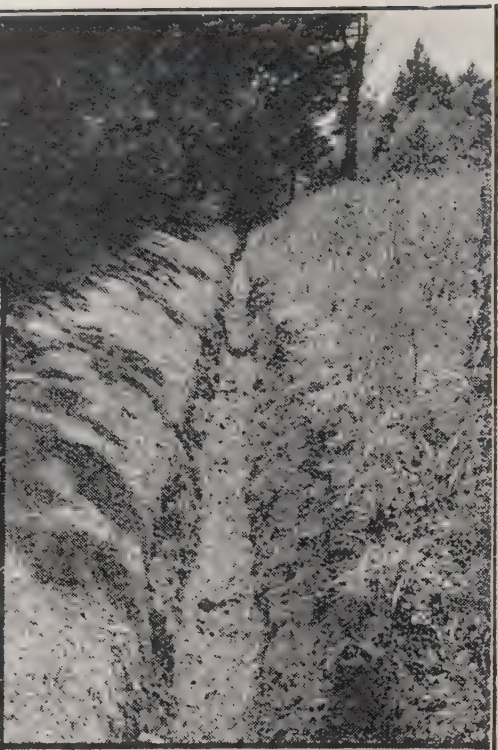
Fruit tree roots cannot remain healthy in a soil that is saturated with water, root development being restricted and the tree producing less leafage. A high water table, by confining healthy root development to a shallow upper layer of soil, makes the tree more susceptible to the effects of drought conditions. As well as causing injury to the tree roots, excess soil water excludes the air which is necessary for the development of the many bacteria and soil organisms responsible for the production of nitrogen in a form available as plant food. The chemical reactions necessary to make plant food available for absorption by tree roots are also speeded up by an adequate air supply.

A completely-saturated soil deteriorates rapidly in both fertility and physical condition and is difficult to cultivate and work to a satisfactory tilth. Drainage improves even the heaviest soils, assisting in the development of a crumby texture and thereby permitting not only earlier cultivation but also better soil aeration.

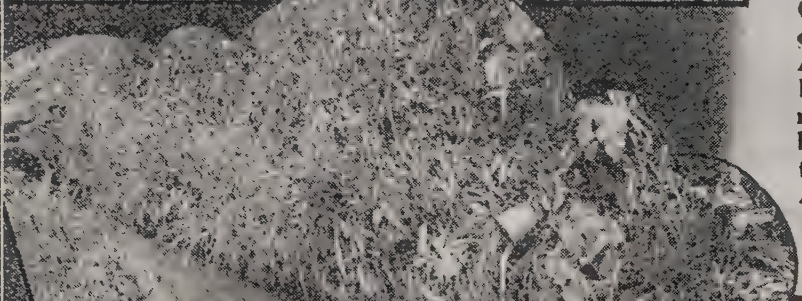
Wet soils tend to remain cold even though the air may be warm, so trees on poorly-drained soils always tend to be backward until the surplus water has been removed. The sun raises the temperature of the soil surface in spring, and the passage of warm rain through free-draining

Orchard Drainage

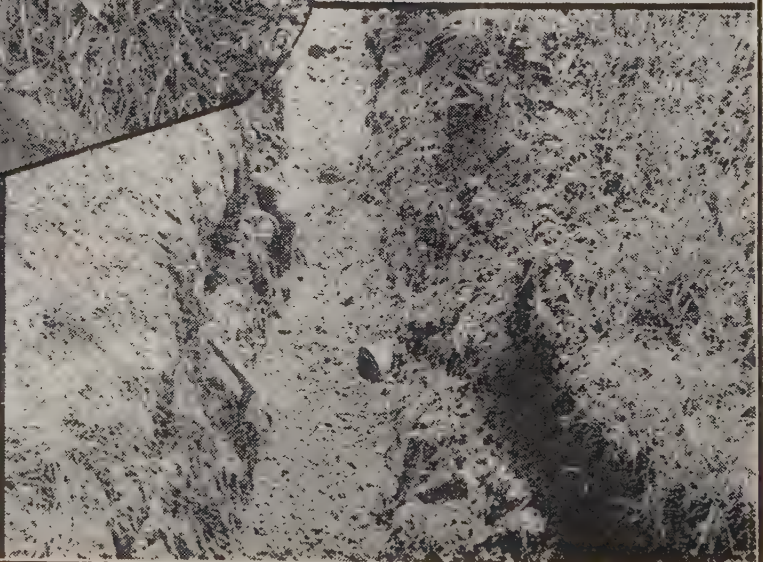




Open drains should be kept clear of weed growth and rubbish. Above left—This culvert has been blocked completely by rubbish which should not have been allowed to remain in or near the main drain. Above right—A well-maintained open drain.



A tile drain outlet should be slightly above the bottom of the main drain. Above—This outlet will not be blocked even when the main drain is carrying a considerable flow of water. Right—This outlet is so low that it is partly blocked.



[*Sparrow Industrial Pictures Ltd. photos.*

ground warms the subsoil and draws behind it fresh air to stimulate plant growth and soil health.

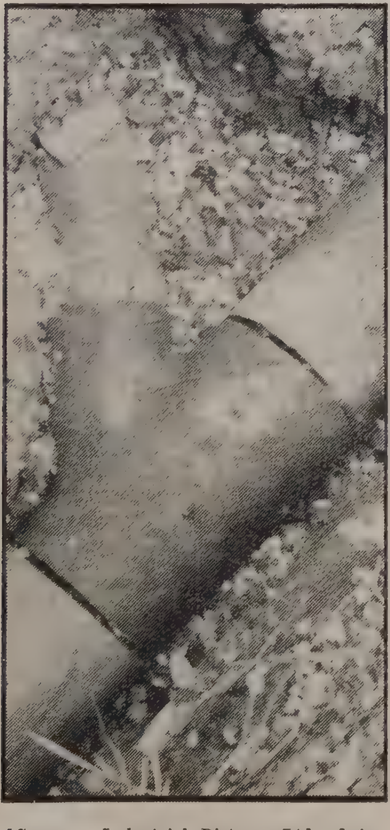
The ideal depth of a drain is one which will maintain the water table low enough to enable the tree roots to develop to their full extent and at a level beyond that to which the soil tends to dry out in summer. In deep silt soils roots may penetrate for many feet, but in a stiff clay subsoil roots are unlikely to develop far because effective drainage is difficult.

Types of Drains

A variety of materials have been used to good effect to provide a channel for surplus water. In most cases the labour cost in opening and closing drains is one of the biggest items, and the use of permanent materials is sound economy.

Open drains serve a useful purpose as main drains, to receive the discharge from the orchard system, and along the orchard boundaries, but, except as temporary measures, their use is limited to this because they interfere with orchard cultivation.

Fascine or brush drains have been used for centuries and when properly constructed are very successful. Though the materials are temporary, such a drain gives satisfactory results and may be used where more permanent materials are hard to obtain. Fairly-strong scrub is preferable, and it should be laid so that the butts of one bundle are covered by the brush of the next.



[Sparrow Industrial Pictures Ltd. photo.
Lateral tiles should enter main tile drains at an angle of about 45 degrees.

[Sparrow Industrial Pictures Ltd. photo.
A deep open drain with insufficient slope on the sides to guard against caving in of the walls.

Tile drains undoubtedly are the most popular and efficient on most soil types. However, in stiff clay soils, where drains would have to be close together and where tiles appear to become sealed by gradual deposits of clay, mole drains would seem to be more efficient provided land contours are suitable. If tiles are used in stiff clay soils, they should be covered with a good layer of gravel or other free-draining material.

Mole drains can be used to advantage where the subsoil is a stiff clay, free from obstruction, and with a fairly-even ground surface having a natural and unbroken fall. They provide by far the cheapest method of draining and, under suitable conditions, probably the most efficient. However, because the drains must be renewed frequently, this system cannot be used where underground pipes are laid for a stationary spray plant except at depths less than that of the spray pipes or in directions which do not cross the pipelines.

Except in clay soils suitable to mole draining, no means is more efficient than the cylindrical tile. If the work is done well, the drains are more or less permanent, and they confer immeasurable and cumulative benefit on both soil and trees.

Of a number of systems of drainage, the two most commonly used are the parallel and the herring-bone. The herring-bone system is the more economical to construct, enabling a greater area to be drained by the same length of drain, but has the disadvantage that a blockage in the main drain may throw the whole system out of action.

Planning the System

A drainage system may consist of one or a combination of the types listed. Each area requires separate consideration, but a grower contemplating drainage should weigh the advantages of each system with particular reference to his own soil type, the fall of the land, and availability of materials. The following factors must be considered:—

Soil type: In reasonably free-draining soils drains may be up to 3ft. deep. Where there is a well-defined, impermeable, clay subsoil the position of the drain is governed by the depth of soil above that layer. The distance between parallel drains depends on their depth and the soil type; in free-draining soils they may be effective if the distance apart is 20 times the depth, but in heavy soils they may need to be as close as 5 times the depth.

Slope of the land: The capacity of a drain depends on the fall as well as its diameter. The greater the fall, the more rapid the drainage. A good gradient at which to aim is 1 in 300, though much lower grades are reasonably effective. The position of the area to be drained in relation to the general fall of the land is of great importance. Unless an adequate fall is obtainable readily, the drainage of an area may prove costly, if not well-nigh impossible.

Outlets are of the greatest importance and should be at the lowest possible point of the area to be drained. If the outfall is a creek or watercourse, deepening or widening it may be necessary. The drain should discharge freely into the outlet, which should be placed so as not to suffer from any obstruction, such as temporary flooding. Outlets should be kept to a minimum number so that regular inspection may be made during wet weather to observe if drains are functioning properly.

Subsidiary drains should enter the main drain at an angle of 45 degrees and never opposite one another.

Protection: Drains must be deep enough to be safe from damage by cultivation implements. Where tile drains pass through shelter belts, concreting the joints is advisable so that tree roots do not cause blockages.

Inspection points should be provided in long lengths of drain so that time and labour may be saved in the event of a blockage.

Construction of Drains

Draining is best carried out during winter, as a clean-bottomed trench or mole is easier to form under damp conditions. Where the fall is even, no preliminary levelling is necessary, but should there be any doubt about the amount of fall available, a spirit level and boning rods should be used, for an error in judgment may destroy the efficiency of the whole system. Loss of fall in a drain leads to silting up.

An even depth is more easily maintained by beginning to dig from the lower end of a drain, allowing any water that may accumulate to drain away. A substantial amount of labour can be saved by turning the first spit with a single-furrow plough.

Drains should be as straight as possible. Curves may be used, but sharp angles must be avoided. A drain should not be wider than necessary, and the sides should be trimmed to avoid the risk of soil falling in while the tiles are being laid. For a good job a draining spade and scoop are necessary. The last spit should be dug with a spade that gives a bottom only a little wider than the tile. When this is cleaned and shaped with the scoop, the tile will bed down neatly without risk of displacement.

Should any portion of the drain be dug too deep, every effort should be made to grade out the depression without loss of fall rather than to build up the bottom with loose soil. If the bed is loose, displacement of the tiles must occur. Where tiles must be laid over a soft area, some form of support, such as a hardwood plank, should be placed underneath to prevent subsidence.

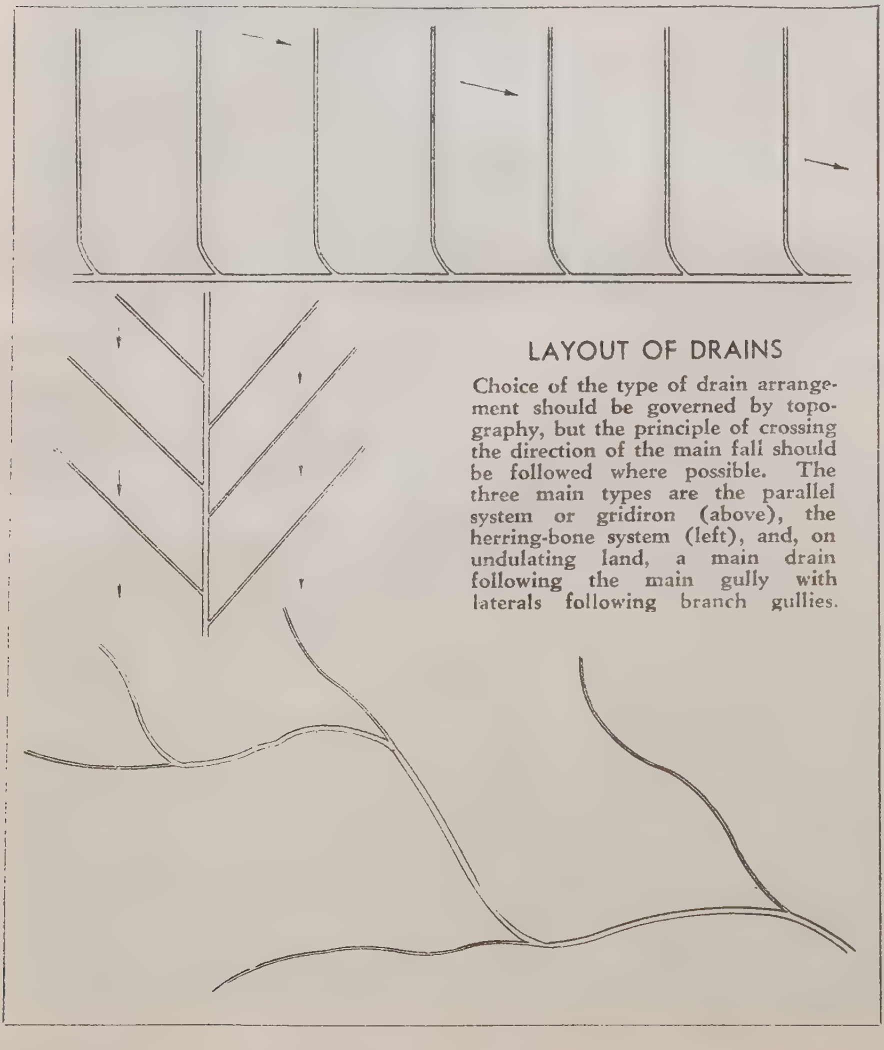
Laying of tiles should always begin at the lowest point of the drain to ensure that one tile does not move away from its neighbour. Joints should be close at the top to prevent soil from working through. To reduce the likelihood of silting up, the tiles should be covered with some form of blinding material—gravel, scoria, or scrub—before the filling of the trench is completed, preferably with topsoil.

Even in heavy clay soils, tile drains should be at least 2ft. deep, and preferably more, and have a good layer of gravel or scoria on top. The deeper the drain, the wider the area drained, provided the subsoil is sufficiently free to permit lateral drainage. Though in heavy soils the full benefit may not be felt for some years, the result will amply repay the extra work involved in deeper drainage.

Laying of tile drains is expensive, but they have a long life if efficiency of operation is ensured by care and thoroughness in construction.

Permanent open drains should be kept clear of rubbish. Their cleaning should be one of the first tasks undertaken after the harvesting of crops is completed. Sides should have a good slope to lessen the risk of their falling in and blocking the drain.

Adequate soil drainage is one of the main foundations of good orchard management. Whatever the method used, the same principles apply and the same rules should be followed: First, plan the whole system before starting operations; second, obtain maximum efficiency throughout the life of the system by attention to detail; and, finally, prepare and keep an accurate plan of the whole system.



LAYOUT OF DRAINS

Choice of the type of drain arrangement should be governed by topography, but the principle of crossing the direction of the main fall should be followed where possible. The three main types are the parallel system or gridiron (above), the herring-bone system (left), and, on undulating land, a main drain following the main gully with laterals following branch gullies.

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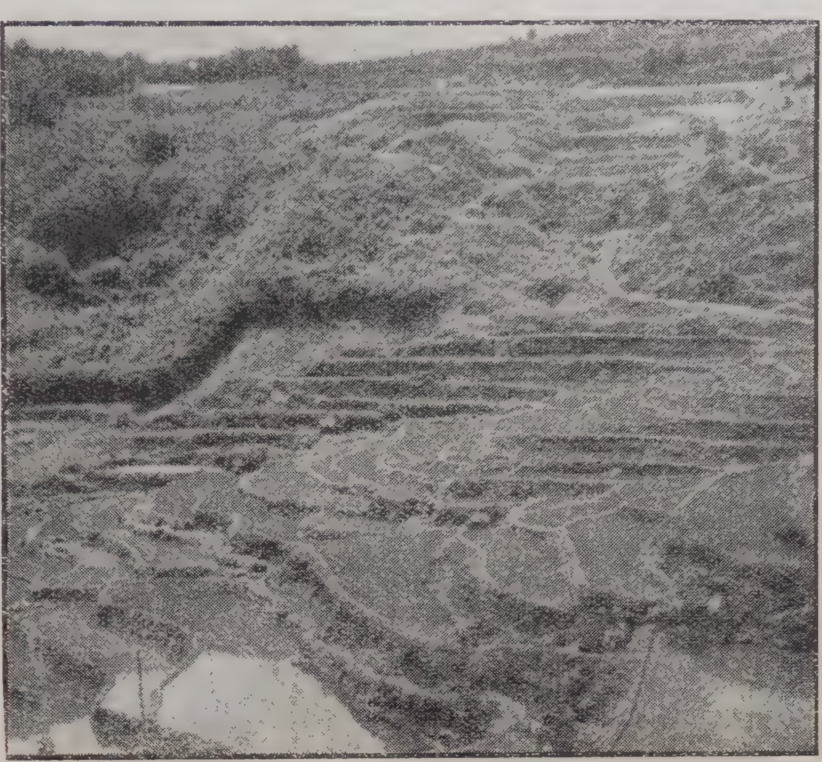
Control of Soil Erosion in Japan

IN few countries of the world has the problem of soil erosion been tackled more thoroughly than in Japan, and Japanese soil-conservation scientists are as up to date in their knowledge as their counterparts in other countries. Yet many denuded hillsides and signs of slip erosion are apparent in southern Japan, and the system of farming in Hokkaido is causing a certain amount of sheet erosion. In this article A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga, who served with the occupation forces, describes the problems posed by erosion in Japan and the measures taken to meet them.



Hill-country terracing in Kyushu.

THE Japanese potential for soil erosion is very great. High, steep mountains only a short distance from the coast cause the rivers to be short and swift flowing. In southern Japan heavy monsoonal rains in spring and autumn saturate the countryside and give the rivers in these areas an abnormal quantity of water to remove in a short time, and periodic terrestrial disturbances, typhoons, and other natural calamities all help to increase the instability of the land.

With the limited amount of arable land available, the Japanese are very much aware of the disastrous results soil erosion could have on the agricultural economy of the country, and considerable sums of money have been spent on erosion-control projects, particularly before the war. During the war preventive measures were subordinated to the all-out war effort, and much of the soil erosion seen in southern Japan is of quite recent origin. Large areas of the forested hill country in these parts have been cut for urgently-needed timber, and many of these cut areas have not been replanted with the thoroughness typical of pre-war Japan.

Forest and Bush Cover

Japan's greatest single protection against erosion is undoubtedly the forest and bush cover of the hills and mountains. It is easy to picture the havoc that would occur on the low-lying rice fields if the surrounding hills did not have the forest cover necessary to absorb the heay rains common in May and June. Without this cover the rain-water would pour in sheets down the hillsides and the rivers would be unable to cope with the flow. Slipping and sheet erosion would be widespread, and many of the rice areas would be flooded. Complete devastation would follow every downpour if the trees and shrubs of the forest did not break the force of the rain and regulate the flow of water to the rivers, thus protecting the lower country.

It follows that the basis of soil-erosion control in Japan is the maintenance of plant cover on the hills, and the close co-operation between the forester and the soil-conservation officer is noteworthy.

Many of the basic principles adopted by the Japanese in soil-erosion control have been introduced from France and Germany and modified to suit local conditions. Furthermore, in the years before the war a large population and low wages made possible the undertaking of forms of erosion control not considered practicable in western countries with a high standard of living. There is little mechanisation of control works in Japan, most of the work having been done by hand. The hours of toil and labour that have gone into much of the hill-country terracing are inconceivable in the western world and are a striking reminder of the low standard of living in much of Japan.

Stabilisation of Rivers

As a rule, the stabilisation of the rivers is the first stage in erosion control. Until this is done the scouring of the rapidly-flowing waters makes any form of stabilisation of the surrounding areas impossible. The aim is to reduce the rate of flow of the river and thus reduce its erosive powers. Small tributaries are dealt with as well as the main stream. This stabilisation is in two forms, first lengthwise control, then flank control.

The principles embodied in lengthwise control are: Making the river-beds less steep by constructing dams and river checks; stabilising the river-bed with rocks or concrete waterways; altering the course of the river so that it may be diverted through country not so susceptible to erosion, and widening the river and thus reducing the velocity of flow.

Flank control, or protection of the river-banks, is accomplished by the construction of bank defence works and frequently by straightening curves in a river.

Methods of Constructing Dams

Dam construction is the most widely-used method of easing the gradient of a river-bed. As these dams are only for erosion control and not for water conservation, the normal practice is to have a series of small dams rather than one or two very large ones. The deposition of silt, sand, and stones on the upstream side of the dam ultimately will raise the river-bed, giving a more even flow.

Many types of dams are to be seen, depending largely on the size and swiftness of the river and on the materials and finance available. The most commonly used material is stone, though concrete is used in all major works. Earth and wood are used frequently as the structural materials of small dams, particularly those in the smaller tributaries. In many cases the stone dam is built by simply piling up stones without any cementing material; this method has the merit of cheapness and ease of construction, but the structure lacks stability and its use is usually confined to small streams. Where the flow of water is larger the stones are usually cemented together.

The Japanese method of building a soil dam starts with the construction of a central heart of stone or tightly-packed clay and shingle, the soil being packed tightly round this central core. If possible, the surface of the dam is further stabilised by the planting of tough grasses.

A timber dam normally is used only for temporary structures. In some cases whole trees are used for the basis of the structure; in others a double row of stout stakes is driven in the stream-bed and the area between them filled with stones. Such dams seldom last much longer than 20 years.

Gully erosion is usually checked by some form of stone dam. Stones are piled to form the top and face of the dam, which is backed up with tightly-packed soil, on which grass is planted. Where stone is not available turves are frequently used, tightly packed at the head of a gully. Wire baskets filled with stones, brushwood bundles, and wooded dams are also used to check gully erosion. In serious cases concrete works may be constructed.

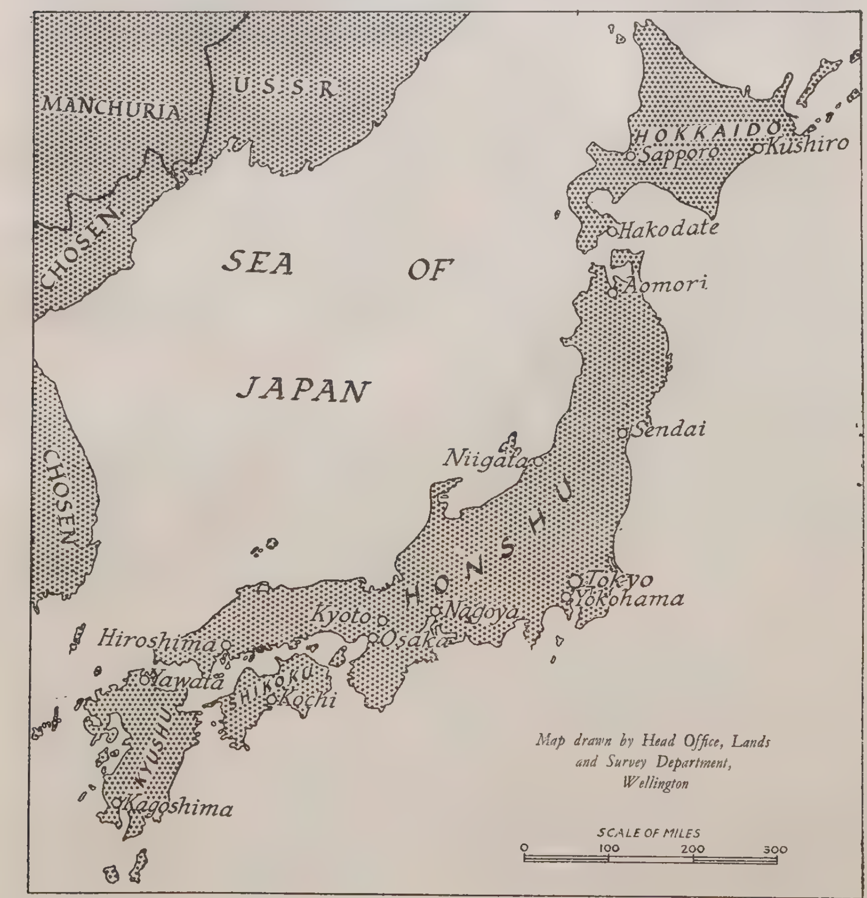
Protection of River-banks

River-banks are protected in several ways. A common sight is a long stretch of bank faced by a well-built stone wall, the stones usually being cemented together to give strength and permanence. Other devices are used to protect river-banks from being worn away—brushwood bundles securely staked down, baskets of stone dropped alongside the banks, or wooden stakes driven into the bed parallel to the bank and the back of them filled with brush. Where banks are very soft and the construction of adequate protective facings is difficult, groynes of stone or stone-filled baskets may be built out into the current to break its force.

The banks of irrigation channels are frequently protected by a lattice framework of bamboo strips.

Deepening of the river-bed is prevented by sinking stone-filled wire baskets or heavy stones over soft spots. If the stream is very shallow, brushwood may be wired to the bed, giving effective protection for short periods. Where permanence is desired a low stone or concrete dam is usually constructed just below the soft area, on which river debris can accumulate.

One frequently-used method of reducing the velocity of streams is to sink rows of wooden piles about a foot apart directly across the bed. The water can readily pass these stakes, but debris is collected between them and the speed of the current is considerably reduced above the piles.



Map drawn by Head Office, Lands and Survey Department, Wellington

Grading Surfaces of Hills

Once the Japanese have brought their rivers under control, they set about stabilising and safeguarding the surrounding hills, with the ultimate aim of having them protected by a dense cover of scrub or trees. This work is often very costly, and in many cases has been postponed until funds are available. The fact that the land is steep does not deter the Japanese soil-conservation officer, who has successfully dealt with slopes so steep as to be almost precipitous.

The first operation is the grading of the hillside to give an even surface. This involves the removal of mounds and outcrops, the spoil from which is used to fill depressions. Any gullies have gully-control works made in them, and channels are made to direct surface run-off water into the nearest stream. Grading is begun at the top of the hill so that any depression below can be filled with spoil from the upper slopes. If the depressions are very deep or steep, wire-netting or stone fences are used to keep the spoil in position until a permanent vegetative cover is established. This grading is the foundation of most hill-country stabilisation, and the greatest care is taken to do the work properly.

Terracing

When the ground has been graded one or several types of constructional work are used, depending on the steepness of the hillside, the type of soil, and the amount of labour available. However, the construction of some type of terrace is the basis of most of these methods.

Where the slope of the hill is less than 30 degrees and the soil is inclined to be stiff in texture, horizontal terraces are constructed with a vertical distance apart of 3 to 6ft. Turves of native grasses are placed on the fronts of these terraces and trees are planted on the terrace itself. This terracing lessens the speed of the run-off of rain-water and enables permanent tree cover to be established. There are many types of this turf-and-seedling terrace, depending to some extent on district customs, but all have the basic principles described. The soil behind the turf is rammed tight, frequently after a bundle of rice straw has been placed at the back of the terrace.

This type of work depends for success on the availability of adequate supplies of turf within easy access of the area. All turves must be solid, well rooted, and capable of binding together into a tight sole. They are secured in place by bamboo or wooden skewers until the grasses have had a chance to take root.

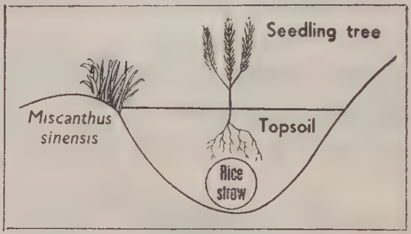
Another type of terrace common throughout central and southern Japan is constructed by the same methods as described above with the face of either stone or turf. Soil is frequently carried from the lower valleys and placed behind the face, but instead of trees being planted in this soil it is used for cropping. With this type of terracing the width of terrace varies greatly.

Another example of hill-country terracing in Kyushu.

On the lower slopes of the hill it may be many yards, decreasing further up the hill. In many cases only the lower slopes are terraced in this manner, the balance of the hill being left in trees. These terraces grow a variety of crops; many are used for fruit growing, and others are irrigated from mountain streams and used for the production of paddy rice. Where adequate water is not available they are used for dry-land cereals, sweet potatoes, and vegetables.

"Belt Works" and Covers

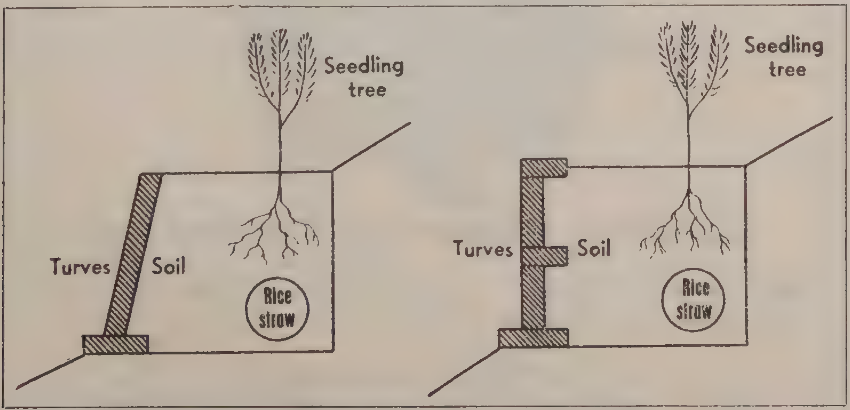
In districts where the surface soil is deep and fertile and the slope gentle, the Japanese frequently use "belt works" instead of turf-and-seedling terraces because such works are far cheaper and easier to construct. Sometimes the two methods are combined. Horizontal level steps about 3ft. high and 2ft. wide are made in a hillside, and the floor of each is excavated to a depth of about 6in., to be filled with topsoil. The grass *Miscanthus sinensis* is planted at the front of the step and the tree seedling at the rear, while in many cases a bundle of rice straw is placed beneath the tree to provide a useful supply of plant food when it has rotted down.



A cross-section of "belt works."

Where a sloping surface is covered with loose soil likely to slip away, protection is sometimes given by netting or brushwood covers. The net is made of plaited straw or *Miscanthus*, and is held in place by pegs driven into the ground where the meshes intersect. Seedlings of trees or shrubs are planted in the meshes. If brushwood is used, it is laid on the ground in layers and weighted down with poles, which are kept in place with pegs.

Where the soil is very moist, either on a hillside or at the foot, or where the ground is very hard and unsuitable for terracing, stone walls may be constructed to hold the soil. This work is costly unless ample stone is available.



Two types of turf-and-seedling terrace.

Stones falling down a hillside could do considerable damage in many places, and this danger is averted by planting live willow stakes in rows to act as fences. As these stakes root and grow, they also help to stabilise a hillside.

Afforestation

Afforestation for erosion control takes two forms in Japan: The re-planting of economically-useful timber trees to replace cut forests, and the planting of so-called soil-improving trees to build up the fertility of the soil. In general, on gently-sloping hillsides trees are planted without any form of terracing and planting is usually confined to timber trees, in many cases pines. On steeper slopes, where terracing and erosion-control works have been carried out, or where the soil has been stabilised by plantings of bamboo grass, "soil-improving" trees frequently take a dominant place.

Tree varieties vary with climate and soil conditions, and trees are planted

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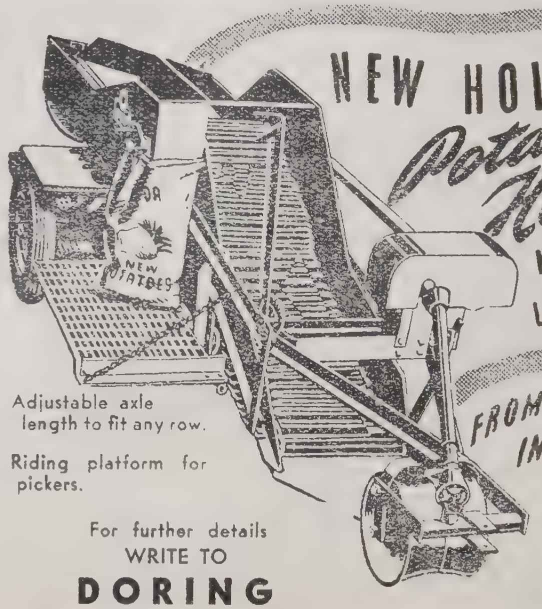

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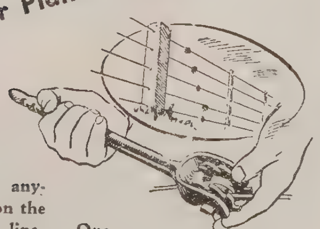

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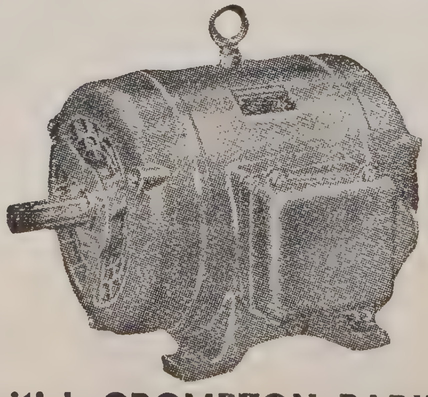

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Terraced rice fields in hill country of southern Honshu.

as soon as possible after the construction work is finished. If possible, shallow-rooting, rapidly-establishing, spreading trees are selected—for instance *Alnus japonica*—these being interplanted with the deeper-rooted pines. Planting is usually denser for erosion control than is normal in ordinary afforestation, trees being thinned later.

If the soil is very soft, bamboo grass is often planted out to bind the surface before the trees are planted, and seeds of plants such as *Miscanthus japonica*, *M. sinensis*, *Lespedeza sericea*, and *Artimesia capillaris* are often broadcast, usually in a mixture, as their different habits of rooting and growth will provide for all variations in soil and moisture.

Of the many trees commonly grown to act as soil stabilisers and soil improvers, some of the most frequently planted are:

Gledischia japonica, a leguminous, sub-tropical tree planted in the southern and central areas of Honshu and in Shikoku and Kyushu.

Gladrastis platycarpa, which also belongs to the order *Leguminosae*, a deciduous tree of temperate zones grown in central and southern Honshu.

Robinia pseudacacia, a deciduous, leguminous tree which originated in North America and is widely grown throughout Japan. It will grow on the poorest of soil but cannot tolerate wet conditions. It likes a free soil, and is planted on the deeper ground of lower slopes.

Lespedeza bicolor (Hagi.), a small deciduous shrub of sub-tropical and temperate regions, grown in all the main islands of Japan. It is planted on impoverished hillsides.

Betula latifolia, a deciduous tree grown in the higher altitudes of Hokkaido and of northern and central Honshu.

Alnus tinctoria (Yamahannoki), a deciduous tree which likes dry areas, growing well on slip faces.

Alnus firma (Yashiyabushi), which grows well in dry districts. Cutting stimulates shooting. It is grown mainly in northern and central Honshu.

Podocarpus macrophyllus, an evergreen conifer widely distributed throughout Japan.

Myrica rubra (Yamamomo), an evergreen of the higher altitudes of the sub-tropical zone.

Fagus japonica and *F. crinita*, deciduous trees of the temperate regions of Japan.

These are typical of the "soil-improving" trees planted in Japan, though they do not by any means exhaust the list of trees and shrubs available. The two principal varieties of pines planted for erosion control are *Pinus densiflora* (Akamatsu) and *P. Thunbergii* (Kuramatsu), the first being used on poor soils where the climate is severe, and the other near the coast.

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Establishing Trees

There are several methods of establishing these species on a hillside. The method of planting trees on terraces and hill faces, already described, is that most commonly used throughout Japan. Others sometimes adopted are sowing the seed and establishing trees from cuttings. *Lespedeza*, *Alnus* spp., *Quercus*, and *Robinia* have all been established successfully in Korea by sowing the seed directly on the hill face, but this method has not been used a great deal in Japan, though it has been the subject of research during the past few years. Cuttings of willows are sometimes planted to stabilise hillsides and have given successful results.

In general, young trees are raised in nurseries, though sometimes they are collected from established forests. Usually they are planted in the spring, great care being taken to give the young seedlings every chance to become firmly established before the following winter. Sometimes compost is carried up the hillsides and spread around the roots.

Trees are planted fairly closely—about 3ft. apart—which allows for a fairly-high mortality (which is frequent on the poor type of soil being handled) and encourages a rapid covering of the ground. In most plantings several species are used, thus allowing for different growth and rooting habits. When the stand is firmly established it is thinned out, as otherwise it would not be able to withstand the weight of the winter snows. The weakest trees are removed. When the *Alnus* spp. lose their vigour with advancing years, the trees are cut right down and allowed to shoot again from the stumps.

Hokkaido's Problem

In Hokkaido the soil-erosion problem is somewhat different from that in the other three islands of Japan. There is not the same heavy monsoonal spring rain and the methods of farming are different. Hokkaido has no terraces on its hillsides, and many of the gentler slopes are under cultivation. Crops are planted up and down the hills, and sheet erosion and gullying are causing some concern. Farmers are now being encouraged to practise contour farming in an endeavour to overcome this trouble before it assumes serious proportions. Serious erosion is also taking place in Hokkaido's apple orchards, many of which are planted on hillsides. As a control measure the planting of orchards with green cover crops (mainly red clover or soya bean) is being advocated.

Most of the hill country in Hokkaido is covered with dense forest, which is itself a safeguard against erosion. Timber felling is strictly supervised, only millable timber being cut, and in most cases the forest regenerates naturally.

Eroded hills near Yamagushi. In the foreground is a peach orchard.

Forest country in Hokkaido.

Erosion in Forests

The erosion which may occur in standing, mature forests under conditions of abnormally-heavy rainfall has been causing Japanese forestry-research workers some concern. When rains of this type were experienced in western Honshu in July, 1943, it was found that large blocks of standing forest had been subject to slipping and landslides. Though forests are one of the most valuable safeguards against erosion, under abnormal conditions of heavy rain the ground may become saturated beyond the depth of the tree roots, with consequent slipping of the ground over the underlying rock strata. This will occur more readily on a deep soil than on a shallow soil where the tree roots have a grip in crevices in the rock itself.

Steps are now being taken to protect established forests from this form of erosion by the construction of engineering works such as retaining walls, water channels, and closed conduits.

Up to the present erosion control in Japan has been largely negative, dealing with the repairing and restoration of eroded country. A growing school of thought is now advocating positive control measures so that protective works can be established before erosion begins. In the past Japan has been held up to the world as a model of soil-erosion control; in future she may lead the world still further along the path that all countries must follow if they wish to save their most precious heritage—the soil.

THE TANNING OF LEATHER

By W. F. DICK, Sheep and Wool Instructor,
Department of Agriculture, Invercargill.

THE conversion of raw hides or skins into leather is not a simple process. It is, on the contrary, a most complicated one, involving on one hand complex chemical reactions between the organic pelt or hide material and on the other a series of inorganic chemical reagents. Besides discussing tanning processes in detail this article points out the heavy loss of valuable material incurred through incorrect handling of hides or animals.

THE origin of tanning lies buried in antiquity. It is probable that the necessity for the simplest form of tanning arose when prehistoric huntsmen conceived the idea of wrapping their shivering bodies in the skins of the animals which they had killed to provide themselves with food. These early hunters first tried drying the skins in the sun, but found that this not only made them stiff and hard, but failed to prevent putrefaction setting in whenever the skins were exposed to dampness. They discovered that better results could be obtained by rubbing the flesh side of the skins over with the fat of the slain animals. This method of preserving skins is still practised by the Eskimos, whose womenfolk first chew the raw sealskins, which they use for clothing, and then rub fat into them. At a much later date, among the benefits conferred upon the human race by the momentous discovery of fire was the means of preserving the flesh and curing the skins of the animals, hunted and killed to provide food and clothing, in the dense smoke arising from damp, green vegetable matter piled on to a wind-fanned fire. In the backward heart of China the smoke method of preserving skins is still employed as it was over a century ago by the South American Indians to preserve the heads of their enemies killed in battle. Another ancient method of preserving skins was by working them with water before rubbing them diligently with a stone. It was in this way that primitive man discovered the efficacy for tanning purposes of alum-bearing rock and water contaminated by the leaves or roots of certain trees, which are now known to contain tanning agents.

It is strange that today in such an advanced agricultural country as New Zealand so many sheepskins should be rendered valueless for industrial purposes by the very same method of curing that first proved so ineffectual in the unskilled hands of the prehistoric hunters—the sun-curing of skins by draping them flesh side exposed to sun and rain.

Nature and Structure of Hide and Pelt

Under its outward covering of hair or wool the animal hide or skin is a structure built up in three layers: The epidermis, the outermost layer, built up stratum upon stratum; the dermis, or true skin, beneath it, comprised of the grain stratum and the corium, with connective tissue between; and the hypodermis, or adipose tissue. Of the whole skin structure the only part that is convertible into leather is that portion of the dermis known as the corium. All the rest is offal and has to be removed before the actual tanning process is commenced.

The structure of the corium is an interwoven pattern of fibres arranged in bundles tied together by fibrous bands of reticular tissue, the crests of the bundles running in one direction and fitting, wave-like, into the hollows of the cross fibre bundles lying at right angles. In the bottom part of the corium these fibre bundles lie almost horizontally, but in the upper portion they lie more steeply, making an angle, known as the angle of weave, of 45 to 75 degrees with the surface of the corium before penetrating the top, or grain layer, of the dermis, where they become finer and split up into fibrils. This angle of weave is important to the leather manufacturer as it is affected during the tanning processes, the fibres assuming different angles, which are regarded as typical of certain types of leather, when carefully tanned. In addition to the main collagen fibre bundles the dermis contains a small proportion of other fibres, elastin and reticulin, which serve to bind the main fibre bundles and to support the hair follicles, blood vessels, and other cells which are situated in the corium. These fibrous tissues float in a soft mucous substance which coagulates like the white of an egg when pelts and hides are dried in the sun, and which acts as a cementing substance, preventing the free movement of the fibre bundles and fibrils. In the tanning process this cementing material is removed and replaced by tannin, which preserves in the tanned leather the resilience and pliability of the raw skin. The hair or wool fibres held in position by the epidermis are produced from follicles in the grain layer of the true skin.

Pressing and baling leather goods for dispatch.

Hides and pelts are constructed of four main constituents: 1, proteins; 2, fats; 3, water; and 4, ash or mineral matter.

Water is held within the structure either mechanically, between the fibre bundles and between the fibrils which compose the fibre bundles, or in chemical combination with certain electrically-charged groups within the protein molecules themselves. The first kind of water can be squeezed out under pressure; the second, known as "bound water," can be removed only by the action of certain chemical reagents which are known as tannins.

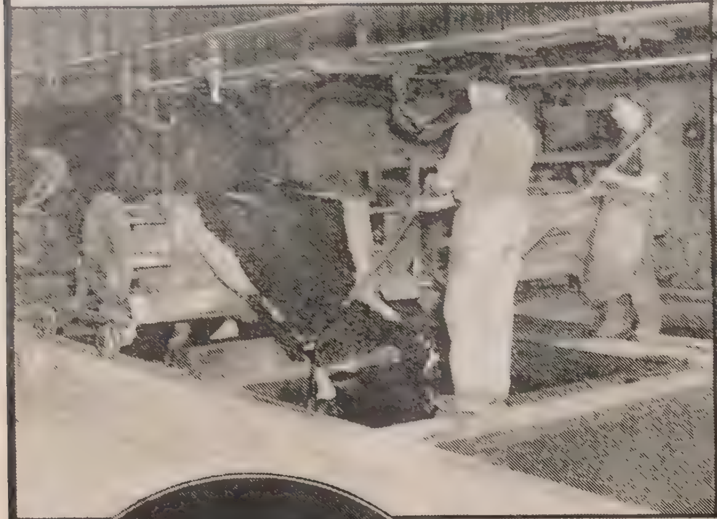
Tanning Processes

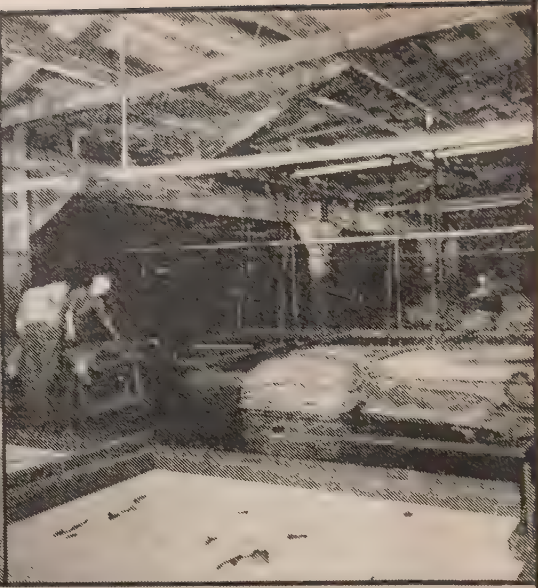
There is a variety of tanning methods, which can be classified according to the agents employed into the following categories: —

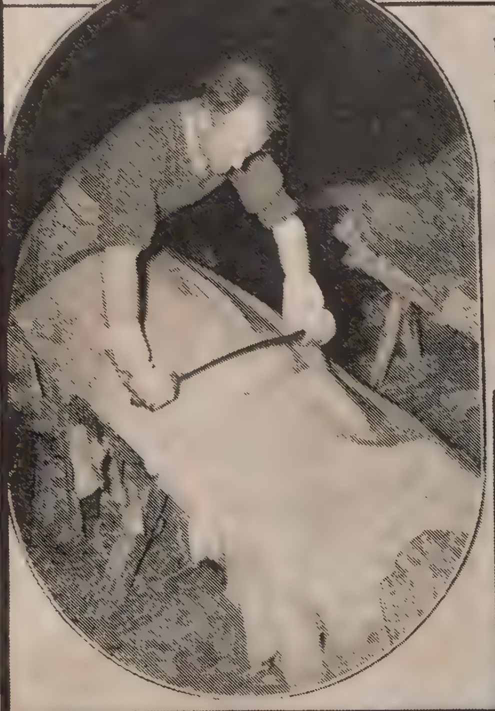
1. Vegetable tannage.
2. Mineral tannage.
3. Oil tannage.
4. Formaldehyde tannage.

The most important of these methods are vegetable tannage, which is employed in producing leathers for shoe

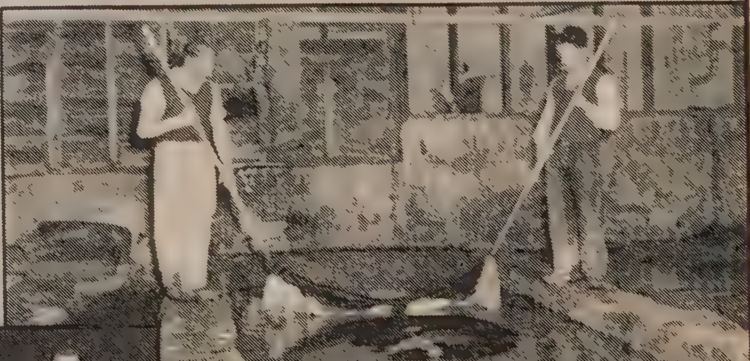
PROCESSES IN TANNING

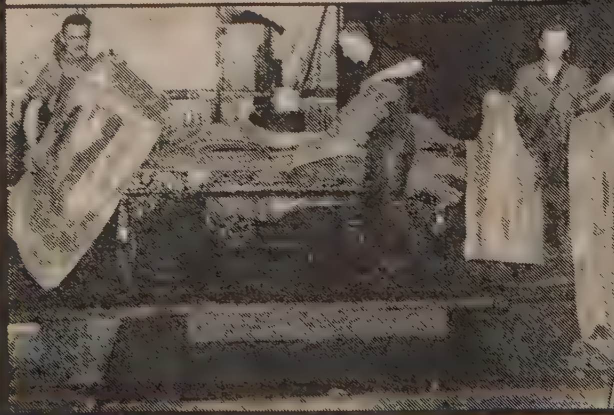


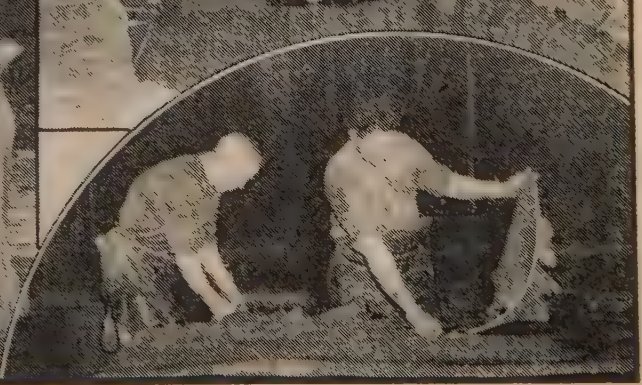




Upper left—Reeling hides from the first clean-water pit to the second in the beam room. The cloudy pit on the right holds the first of the lime liquors, which loosen the hair, and swell and plump the hides. Upper right—The agitators, the brick-lined pits which contain the weakest vegetable tanning liquors. Note the overhead rocker arms and the frame, from which the hides are suspended, in the pits on the right. Middle left—A scudder at work. Middle right—Dragging the lime pit. Lower left—A cropped hide showing the bend (left), and the offal, the shoulder and belly portions (right). Lower right—Cropping: Cutting the hide into bend, shoulder, and belly.







uppers, slippers, shoe linings, bags and handbags, windproof jackets, and coats; chrome mineral tannage, which produces the best greenhide and sole leathers; and oil tannage, used in preparing chamois leather and gloving. Fish oil is employed in the last-mentioned process, cod oil being best, though whale oil is often used as a cheaper substitute. Every type of tannage imparts different characteristics to leather, which is thus made useful for a wide variety of purposes—a line of cowhides may be either chrome tanned to make leather for shoe uppers or vegetable tanned for upholstery leather.

Vegetable tannins are recovered from a large number of barks, woods, leaves, fruits, roots, and excrescences. These include mimosa—used widely in New Zealand—from the bark of Australian wattle grown in South Africa, hemlock—used widely in America—oak bark, and mangrove; chestnut and quebracho from wood; valonia and myrobalans from fruit; sumac from leaves. Vegetable tannins all possess the quality of astringency by which they contract the pelt fibres and abstract the bound water from its chemical combination in the protein molecules. Vegetable tannins are classified according to their astrigency into highly-, moderately-, and weakly-astringent groups, each of which produces a different type of leather, varying from the thin, hard leather with a weak, drawn grain of a quebracho-tanned leather to the soft, plump leather tanned with myrobalans.

Objects of Tannage

The objects of the tanner in converting raw pelt into leather are, briefly, to permeate the pelt substance with a chemical agent which will protect it from putrefaction, to replace the water content and destroy the power of the protein molecules to attract and retain their bound water, to preserve the natural pliancy and resilience of the raw skin by removing the cementing material, and to make the leather soft and attractive. Some leathers are hard, almost as hard as iron, but they owe this hardness not to the actual tanning process, but to special treatment after tanning.

Because of its wonderful construction and because of the treatment it receives during its conversion from the raw skin, leather is the strongest of the flexible materials man employs. It is also able to withstand severe friction and heavy strains to a remarkable degree, besides being light and durable, warm, and comparatively waterproof.

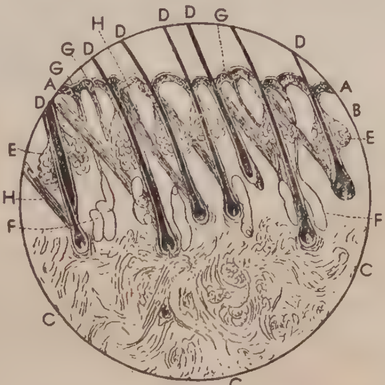
A large number of processes is involved in converting raw hides and skins into leather. They may be divided into three stages: First, preparing the raw hides and pelts for tanning; secondly, the actual tanning processes; and, thirdly, finishing, or dressing, the tanned leather.

Leather tannage is divided into two main classes—heavy leathers and light leathers. Ox and cow hides make heavy leathers; sheep, lamb, calf, deer, and rabbit skins, etc., are converted into light leathers. The best of the heavy hides, ox hides, are chrome tanned to make greenhide sole leather. Cow hides are vegetable tanned to make sole leather, upper leather, and bag leather. With light leather chrome tannage produces the strongest and best stitching leathers used in the handbag and clothing trades and for making shoe uppers. Vegetable-tanned light leathers are used mainly for shoe linings and slippers. Formaldehyde tannage produces chamois leather and gloving, either plain or suede.

Heavy Leather Tannage

From the hide stacks in the "beam shop" hides loosely tied together end to end to form packs of about 80 hides are daily reeled over into soakage pits, which are arranged in sets of 8 or 9 pits, varying in number according to the capacity of the tannery. The first pit, and frequently the second, contains clean, cold water, preferably soft water, in which the hides are immersed for 24 hours to cleanse them of extraneous dirt and blood and to restore them, as nearly as possible, to their original and natural condition. The following pits of the set are the lime pits containing milk of lime liquor to which extra lime is added daily to maintain an excess of free lime. These pits are plunged daily to bring the free lime up from the bottom and allow it to settle on the freshly-reeled-in pack of hides.

SECTION OF CALF SKIN



A—Epidermis. B—Grain layer.
C—Fibrous layer of skin. D—Hairs.
E—Fat glands. F—Sweat glands.
G—Opening of sweat gland ducts.
H—Hair muscles (erector pili muscle).

[Reproduced from "Principles of Leather Manufacture," Professor H. R. Procter: E. and F. N. Spon, Ltd., London.

The complex action of the lime liquor on the raw pelt is responsible for both physical and chemical changes affecting the epidermis, the dermis, and the hypodermis. The epidermal layer, which holds the hair in position, becomes disintegrated and the hair loosened, while the adipose tissue becomes softened so that later it can be removed by the fleshing knives or the fleshing machine. The most interesting actions, however, occur in the true skin, or dermis, which becomes swollen and "plumped" by the lime liquor. Swelling makes the hide soft and flaccid, but plumping, which is caused by the chemical affinity between the collagen, or protein, in the hide and the water, makes it firm and rubbery—almost like gristle. The lime liquor penetrates between the fibre bundles and the fibrils and causes them to split and separate, the degree of splitting depending on the type of leather required and being governed by the length of the liming process. Liming also increases the chemical activity of the collagen molecules and enables them later to combine with more tanning liquor than an unlimed pelt could absorb. At the same time the fat cells are broken down and the fat removed from the hide by conversion into lime soaps.

In fresh lime liquors the depilatory (hair-removing) and plumping actions are slow, but during the course of the liming process the sulphur content in an amino-acid called cystine (which is only one of the many amino-acids present in keratin, the protein of which hair, wool, and the disintegrated epidermal cells are composed) becomes liberated and combines with some of the lime to form a powerful reducing agent (calcium sulphide), which hastens the hair-removing action of the lime liquor. Hence, while fresh lime liquors produce more plumping of the hides, old lime liquors have a stronger depilatory action.

Chemical agents are frequently added to lime liquors to increase their depilatory and plumping actions. Such agents are known as "sharpening" agents and the lime liquor as a "sharpened" liquor.

After about a week in the beam shed hides are removed from the sharpened lime pits and split up the line of the backbone into sides, which are dehaired by a machine with a spiral, revolving blade like that of a lawnmower.

The hair is washed in a cold-water pit, spread out on grating to drain, dried in a steam-heated room, and baled in wool packs for dispatch, to be used in making articles such as floor coverings and brushes.

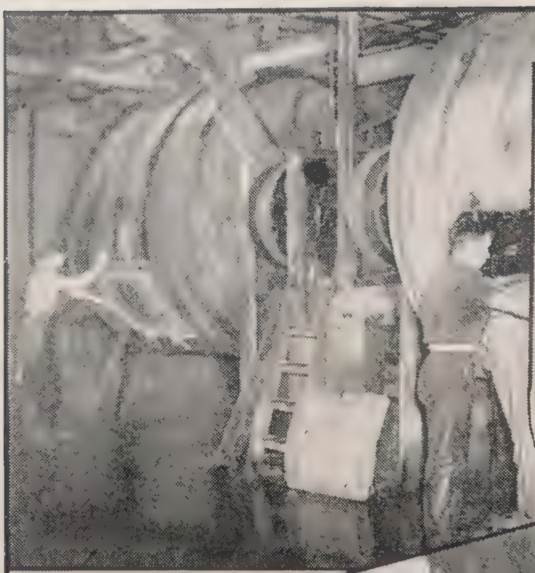
Fleshing

After the hair has been removed the limed sides go forward to the fleshing machine, which removes the hypodermis—now swollen into a soft, jelly-like state by the liming process—from the rubber-like dermis. Fleshings are sold for rendering down into tallow. Next, sides are stacked up beside the trimming table where loose ends and rough, inferior pieces not removed by the fleshing machine are cut off. The offal from this operation forms the basis of gelatine.

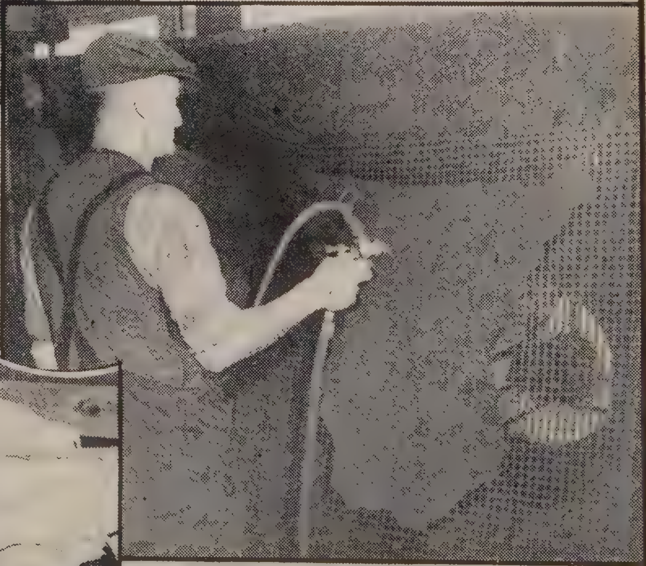
Deliming

The limed sides have now to be delimed. The sides are placed in cold water to remove only the surface lime at this stage, but with chrome sides the process is much more thorough and consists of "paddling" the pack of sides in wooden half-drums containing clean, cold water to which a weak solution of boric acid, or ammonium salts or sulphuric acid plus a "buffering" salt to prevent swelling of the pelt, is usually added. The water removes the surface (mechanically-held) lime, while the chemical agent assists in removing any lime which has combined chemically in the lime liquor pits with the pelt collagen. A revolv-

PROCESSES IN TANNING



Upper left—Removing the hides from the hot drums—the final process in vegetable tanning. Upper right—Making chamois leather. The oil-tanned pelts are hung for 1 or 2 weeks to absorb oxygen from the air. As oxidation proceeds skins change colour from white to rich orange. At side—The staking machine, which gives leather softness and pliancy.



Above—Spraying a coloured lacquer finish on to a tanned sheep pelt which will be made into women's slippers. Left—Hand staking chamois leather.

ing paddle agitates the pack of sides, thus hastening the deliming process.

Scudding

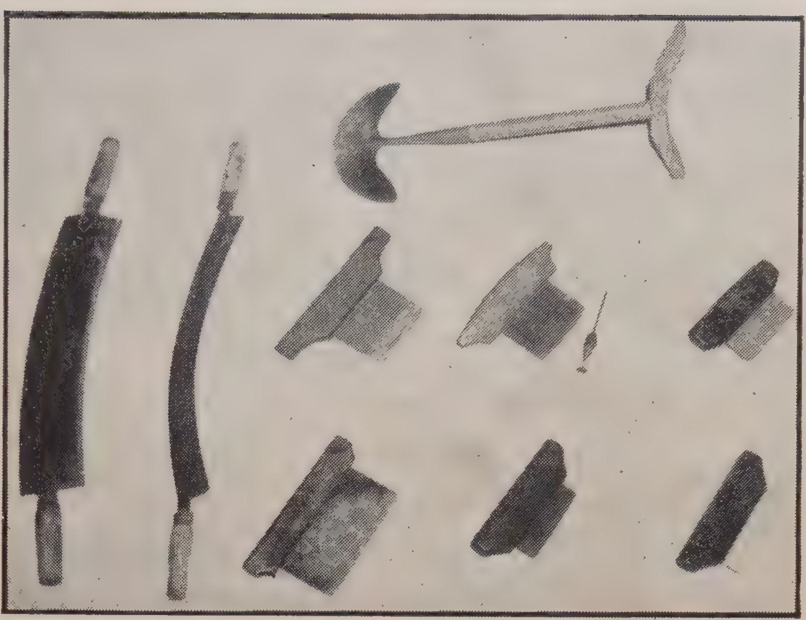
The next operation is scudding. The loosened "scud"—hair roots, short hairs, pigmenting matter, epidermal tissue, lime soaps, grease, and degraded pelt-cementing substance—is cut off either by a scudding machine or by operators known as scudders, who are armed with double-handled, long, curved-bladed knives, the curvature of which matches that of the tanner's beam on which the hides are laid out for manual scudding.

Bateing

In making chrome sole leather and very-soft-handling leathers bateing follows scudding. The cold water in the paddles is replaced with warm water to which is added the bateing material composed of dried and finely-ground sheep or cattle pancreas, ammonium chloride, and sawdust or wood flour. The bateing process depends on the action of the enzyme trypsin present in the pancreatic material. Trypsin, which breaks down proteins, opens up the collagen fibre bundles and fibrils beyond the stage achieved by the liming process and makes the hide structure more porous, thus speeding up and increasing the absorption of tanning materials at a later stage. The ammonium salt, besides continuing the deliming process, maintains the bateing liquor in the optimum condition for the satisfactory functioning of the enzymic action. The sawdust provides suspended matter which facilitates the action of the trypsin. Bateing also removes all the swelling from the pelts.

Before the modern synthetic bate was introduced hen or pigeon droppings were used, though "puering" with dog faeces was sometimes done. Bacteria and possibly an enzyme were responsible for results obtained by the old-fashioned methods, which are still employed in some countries in manufacturing certain kinds of leather, for example, goatskin leather.

When bateing has been completed the hides are soft, pliable, almost transparent, and ready for grading, though in some tanneries they may be drenched first in a warm-water bran liquor, which improves the colour and appearance of the finished leather.



Some of the tools used in the tanning trade. Left—Outer, fleshing knife; inner, scudding knife. Top—Hand staker for working chamois leather. Middle, left to right—Coarse slicker, buffing slicker and steel, pebble (polishing harness leather). Below, left to right—Fine slicker, stone, and glass.

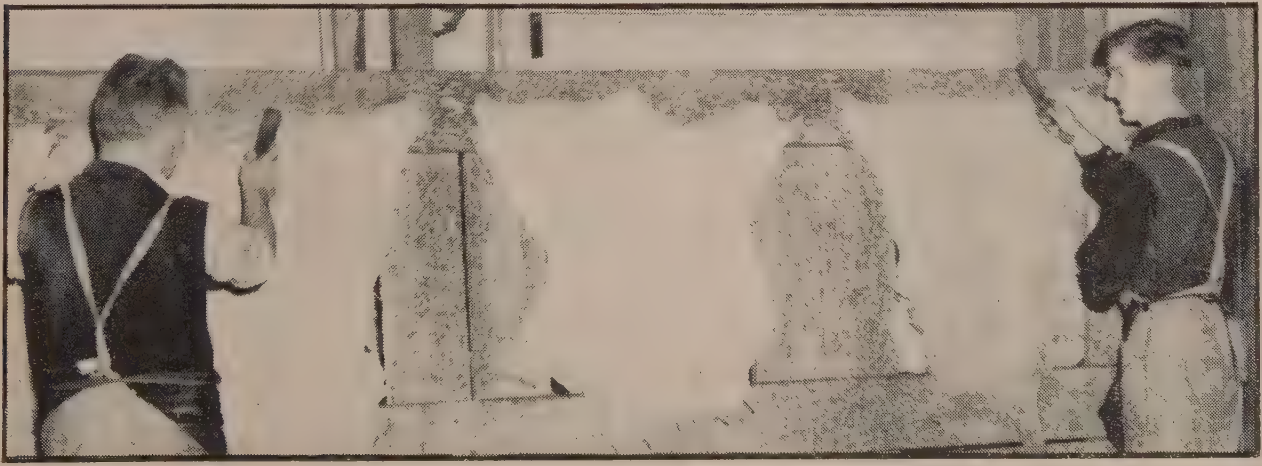
Grading

When sides are ready for tanning they are graded for "crop" and "chrome." Crop is vegetable-tanned sole leather, while chrome leathers include the best ox hides used for greenhide as well as splits for making into shoe uppers, though these may also be vegetable tanned for upholstery purposes.

Tannage Processes

Whatever the method employed the object of the tanning process is to combine chemically as much of the tanning agents as possible with the hide protein collagen; to replace the bound water originally present in the protein molecules; to stuff the interfibrillary spaces, created by the splitting of the fibre bundles and fibrils during the liming and bateing processes and left vacant by the abstraction of lime during the deliming and bateing processes, with as much tannin as possible; and, at the same time, to ensure a good colour, handle, and appearance in the leather.

The desired finish is accomplished by beginning the tannage in a very weak mellow liquor, which has great penetrative power, and gradually increasing the strength of the liquor by the use of more astringent agents, which, if employed at the outset, would merely clog the spaces in the surface layer of the pelt and prevent the



Tacking tanned hides on to movable frames for the final drying.

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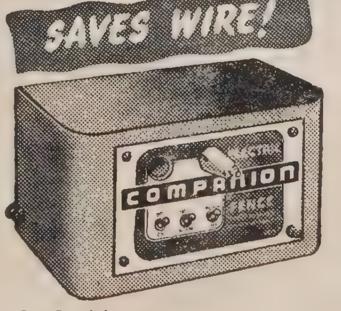

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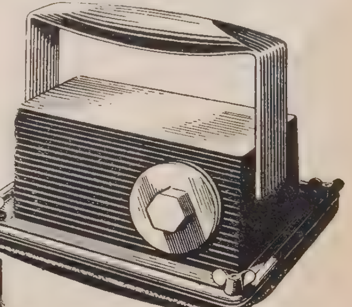

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penetration of the tanning liquor into the deeper tissues, leaving them untanned.

Vegetable Tannage

Vegetable tannage is carried out in brick-lined pits, the first set being known as the agitators, because a rocker arm agitates the suspended sides in the tanning liquor, which in New Zealand is usually a mimosa or mimosa-myrobalans liquor. The myrobalans are a stronger and more astringent tannin employed in the final tannage stages. The pack is placed in the "tail" or "hinder" pit, which contains the oldest and mellowest liquor from which the more astringent of the tannins have been extracted by previous packs of sides. The sides remain in the agitator pits for about a fortnight, the strength of the liquor increasing daily as fresh liquor pumped into the tail forces the older liquor out and into the succeeding pits.

After the preliminary tannage described above has been completed the sides are cut into three parts: The bend, belly, and shoulder. The bend is the best part of the hide—the back and sides—and receives a heavier tannage than the offal—the belly and shoulder. For convenience, the bend, belly, and shoulder are then tanned separately, as they are used for making up into different types of leather.

Tannage is continued for 5 to 6 weeks in "layer" pits containing still more astringent liquors, which pack into and fill up the interfibrillary spaces in the leather. As still further tannage is required to produce the best and heaviest type of sole leather, the bends are transferred to a "hot" pit—a pit containing a strong tanning liquor heated to about 100 degrees F. Heat opens up the fibres and allows more tan to be packed between the tissues.

On removal from the hot pit the bends, still not fully tanned, undergo treatment designed to enable them to absorb the most astringent tannin and complete the tannage process by packing the outer layers of the leather with a highly-astringent tanning agent. In this treatment excess tan liquor is removed by a "striker" machine, which squeezes and "sets" the bends between a revolving brass blade and a leather-lined cylinder. After being partly dried out overnight in the drying room under carefully-controlled temperature and moisture conditions the bends, together with the strongest tanning liquor—sulphonated marine oil (usually cod oil, but sometimes whale oil)—sugar, and Epsom salt, are placed in a revolving peg drum, which flexes the leather and enables it to absorb more of the ingredients. Besides improving the colour of the leather the sugar and Epsom salt act as a filler, while the oil serves as a lubricant to protect the tannage against oxidation. After an hour in the peg drum the bends are cleansed again of surplus liquor, re-oiled on the grain side, and placed in another drying room for 3 or 4 days. They are then hosed on both sides with hot, soapy water to remove any excess surface tan and returned to the drying room for a few hours. Some moisture is left in the bends to condition them for rolling on an adjustable steel table with a brass roller exerting a pressure of about 5 tons per square inch, which compacts and firms up the leather. Finally the leather is dried and it is then ready for grading according to quality, weight, colour, and defects (freedom from flaying cuts).

Pickled pelts and lamb pelts are graded for weight or quality before being tanned into various types of light leathers.

In the chrome tanning process, which produces the best greenhide and sole leather from heavy ox hides, shoe upper leather from split hides, and harness, belting, and strap leathers from cow hides, the delimed pelts are tanned either in revolving peg drums or in paddles, sometimes partly in both. The tanning agent is a basic chromium salt, usually basic chromium sulphate, which is increased in basicity as tannage progresses. In the early stages the milder liquor penetrates the hide substance quickly and completely and produces a smooth, silky grain. Once the grain has been "fixed" stronger liquors can be used to produce a fully-tanned leather.

Before being placed in the first tanning liquor pelts may be pickled in a solution containing sulphuric acid (to produce fine splitting of the collagen fibre bundles) and salt (to prevent plumping of the pelt substance by the acid). They are then given a preliminary tanning in a weak liquor for 24 hours, after which the excess liquor is removed by running the pelts through a squeeze roller and hanging them up to dry for a short period. At this stage pelts required for making shoe uppers are split by a band-knife splitting machine and shaved to remove any flesh adhering. The hides are then ready for the strong, basic liquor, which completes the tannage process. On removal from the paddles the hides are "horsed up"—stacked up (in earlier times over a wooden horse)—to allow them to drain and the tanning agents to become fixed. Hides are next paddled in clean, cold water containing a neutralising agent—usually borax or sodium bicarbonate (baking soda)—before being dyed in a revolving peg drum. After being hung up to dry partly the leather goods are "stuffed" with a mixture of hot oil and tallow, or fat liquored, in a steam-heated revolving peg drum which in 45 minutes of "tumbling" flexes the leather and pounds about 4lb. of the hot grease into each side. After immersion in hot water, which softens the grease and improves the pliability of the leather, the leather goods are laid out on a table for setting out with a slicking knife, which removes excess grease and smooths out the surface. The goods are now hung up for a day to dry, reset to overcome the tendency to shrink during the drying stage, and then nailed to wooden frames for another partial drying at room temperature to prepare the grain surface for the embossing (printing) operation in which the pattern is stamped on the leather under pressure. After printing, the leather goods are completely dried out in preparation for the shaving machine, which levels the surface and removes any roughness. The surface of the leather is then worked with a staking machine, which makes the leather softer and more pliable, and an application of neatsfoot oil is brushed in on the grain side. The goods are now graded for quality and sold by weight.

First-quality sides for sole leather, greenhide, straps, belting, and harness must be free from flaying cuts.

Light Leather Tannage

Light leathers are made from sheep and lamb pelts, calf, deer, pig, goat, and many other skins. Sheep and lamb pelts and calfskins, the by-products of freezing works and abattoirs, form the basis of the light leather industry in New Zealand. Calfskins make shoe upper leather, both plain and suede,

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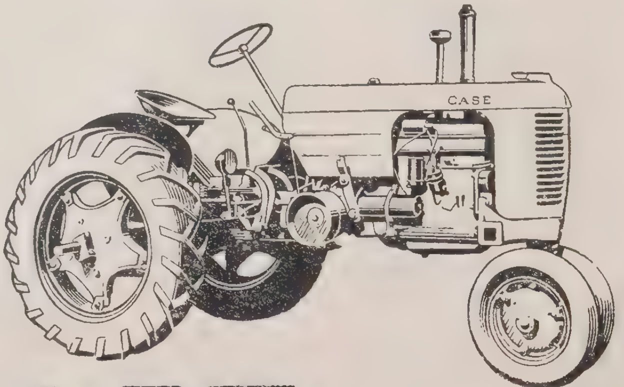

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while sheep and lamb pelts are graded according to weight into "socking"—thin, papery pelts used for women's shoe linings—"coat and bag weight" and "splitters" for chamois leather upholstery, and bag leather.

Chamois Leather

The split lamb pelts are first pickled in an acid medium which results in fine splitting of the fibres and fibrils and which produces a very soft-handling, pliable leather. The goods are then depickled before pre-tanning with formalin. After "dosing up" for two or three days the goods are ready for the oil tannage, which is done by drumming with a mixture of fish oils, usually cod or whale. After drumming, the skins are hung for a week in a well-ventilated room. During this period the oil oxidises and the colour of the skins changes from a dull white to the rich yellow or orange colour characteristic of chamois leather.

The next operation is to remove the surplus oil by placing the goods in a drum of hot water and soda ash to emulsify the oil, followed by another soaking in hot, soapy water. Surplus moisture is then removed by hydraulic pressure and the goods are hung on frames to dry. When sufficiently dry they are placed over a perch (wooden frame) and further softened by manual staking. (The operator works the skins over with a half-moon-shaped blade—like a gardener's edging tool—which is attached to the end of a short wooden stock that fits into the shoulder like the head of a crutch.) The skins are next buffed on a revolving cylinder coated with fine emery powder, which puts a nap on the surface, and then trimmed with a pair of sharp sheep shears, following the original outline as far as possible to avoid wastage of good leather. Finally skins are graded for quality and size.

WASTE RESULTING FROM HIDE DAMAGE

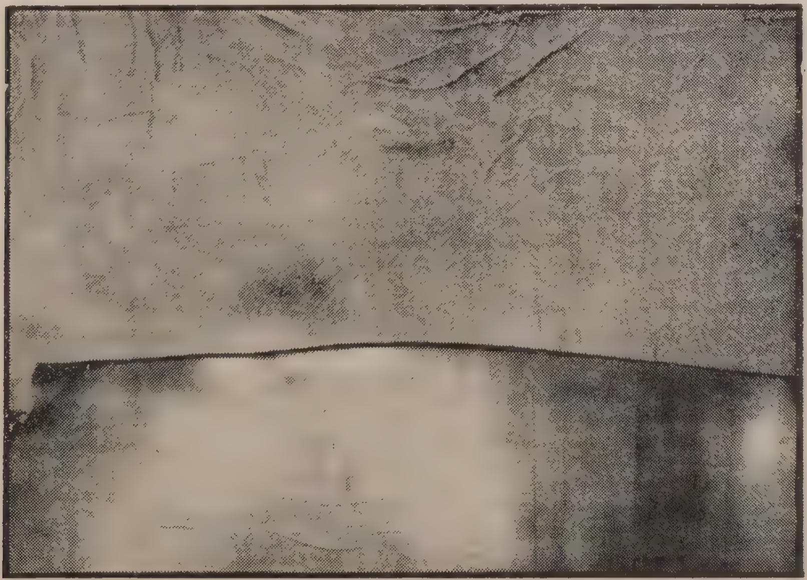
Brand marks ruin much potentially-valuable leather. Compare the size of the men's boot soles with that of the different brands. Brands should be kept as near as possible to the minimum of 2in. in size, and the use of additional identification marking should be avoided as far as possible.

Damaged Hides

Hide damage is responsible for unduly heavy wastage of leather. Though, fortunately, New Zealand is free from the parasites that are the chief cause of damage to hides in other countries, much damage arises from other causes. Barbed wire scratches damage many hides, but by far the greatest proportion of hide damage can be traced to two causes: First, careless flaying and fleshing at freezing works and abattoirs; secondly, fire branding.

The elimination of damage arising from these sources would not only make much more best-quality leather available to meet the existing demand, but, by eliminating the uneconomic processing of faulty hides, would contribute toward the reduction of leather manufacturers' costs. A damaged hide costs just as much to process as a sound one, but its value as leather may be only half that of unblemished leather.

As an indication of the serious extent of flaying and branding damage in New Zealand the experience of one tannery is cited. The tannery, which specialises in the manufacture of heavy bends for sole leather—the most valuable type of leather goods—is supplying only 25 per cent. of its orders despite the fact that it is handling sufficient hides to meet all demands. The stricter supervision of flaying operations, the use of fleshing machines in freezing works to replace manual fleshing, the limitation of brands to the minimum size required under the Stock Act, and the elimination of fire brands would save much valuable raw material for the leather industry—an industry that supplies domestic and industrial materials which are essential in a modern community.



It is estimated that 15 to 20 per cent. of hides are damaged by careless flaying and defleshing at freezing works and abattoirs. Such damage represents a big loss of valuable leather and increases the cost of leather goods, as sound leather must bear the costs attached to processing damaged hides. Damage does not show up until leather has been tanned. The bends in this photograph illustrate loss of best-quality leather.

CARE OF LIVESTOCK DURING APRIL

Contributed by the Animal Research Division.

CARE OF CALVES

THE best way to prevent calves dying during the winter is to treat them properly during the autumn. They should never spend more than 2 or 3 days in one paddock and should be rotated ahead of the cows through the best paddocks available. Good-quality hay should be provided for them daily, especially when the feed is growing fast after the autumn rains. At the first sign of scouring they should be drenched with phenothiazine.

* * *

DRYING OFF DAIRY COWS

A dairy cow requires a reasonable spell between lactations and should be dried off at least 6 weeks before she is due to calve. This should be done even if she is still milking heavily.

* * *

AUTUMN-SAVED PASTURE

Early-calving cows are nearly always short of feed during July and August and often during September. In most seasons pasture is not growing fast enough during these months to meet the requirements of milking cows. Crops are expensive to grow and concentrates are even more expensive to buy. It costs nothing, however, to shut up pasture in the middle of April and let it grow for use in early spring. About a sixth of the dairy area should be shut up in this way. Full instructions regarding the best paddocks to spell and the best method of feeding autumn-saved pasture by the use of electric fences will be found in an article on page 177 of the February issue of the "Journal."

* * *

DECEMBER-FARROWED PIGS

Litters farrowed in December should be sold as pork. If they are carried on to bacon weights, no milk will be available for the later litters, which will have to be sold cheaply as stores or wintered on expensive concentrates. Available root crops may be fed to sows, but they require supplementing with milk or meat meal.

* * *

CARE OF EWES

If rams remain with the ewes for more than 4 weeks, they should be raddled on the brisket so that the late-lambing ewes can be drafted off. Once the ewes are in lamb their level of feed should be lowered to prevent their becoming too fat. By increasing the rate of stocking during the autumn some paddocks can be shut up and pasture allowed to grow for grazing during the 3 weeks before lambing. These measures will greatly assist in reducing "sleepy sickness," which is most prevalent in fat ewes which are inadequately fed just before lambing.

* * *

RED WORMS IN HORSES

Red worms can seriously reduce the efficiency of working horses and are responsible for many deaths in foals. Phenothiazine is a very effective remedy, but is best given under veterinary supervision, as in certain conditions it may prove dangerous. Treatment should be administered before the winter.

* * *

CARE OF LAMBS

If the summer and autumn have been wet, lambs are likely to be suffering from worms. Drenching with phenothiazine two or three times at 3-weekly intervals will help. This applies particularly to the tail of the flock, which should be drafted off for special attention. Feed, however, is the most important consideration. During the autumn lambs do best if grazed on pastures which have been allowed to grow to a height of about 6in. Hay aftermath and red clover are both very good. If these are not available, the lambs should be distributed thinly over the dairy paddocks or on hill pastures. They should on no account be concentrated in large numbers on short, rapidly-growing pastures, especially if these have previously been grazed by ewes and lambs.

* * *

THISTLE POISONING OF CATTLE

Serious mortalities have been reported when hungry cattle have been grazed in paddocks very heavily infested with winged or variegated thistles. If it is not possible to cut and remove these from the paddocks, care should be taken to see that hay or other food is available so that the thistles do not constitute a large proportion of the diet. If any cattle grazing in infested paddocks are found to be distressed and breathing heavily, all the cattle in the paddock should be very quietly moved into a clean paddock and veterinary aid should be enlisted immediately. Fuller details will be found in an article "Nitrite Poisoning in Cattle and Pigs" in the April, 1947, issue of the "Journal."

* * *

TUBERCULOSIS IN POULTRY

Tuberculosis not only causes considerable loss in poultry, but it frequently spreads to pigs and causes condemnations at meat works. If this disease is suspected, veterinary aid should be sought with a view to eliminating affected birds.

Farming a Mixed Holding on Taieri Plain

By W. R. LOBB, Instructor in Agriculture,
Department of Agriculture, Dunedin.

THOUGH New Zealand is primarily a pastoral country, there are relatively-small areas where farming is diversified. A striking example is the Taieri Plain, where variation in farming pursuits is quite general, fat stock raising, the production of market garden and field crops, and dairying all being represented. The practices which govern the production of a range of commodities on a typical mixed farm on the Taieri Plain are described in this article.

THE Taieri Plain, of about 38,000 acres, lies to the south of Dunedin. On the whole it is fertile, productive, and closely settled. It is bounded by a low range of hills on the coastal side and by the Maungatua Range on the south-west and west. It is roughly bisected by the Taieri River and much of the southern portion is low lying and requires protection from floods. The most fertile portion of the area contains soils built up by periodic flooding from the Taieri River. In recent times this process was accelerated by man-made erosion on the upper reaches and in the catchment areas of the Taieri where gold seekers sluiced away millions of tons of soil which was eventually deposited in the Taieri basin. In the early days the settlement of the plain was retarded by the swampy nature of the land and many of the pioneers confined their farming pursuits to the surrounding hills.

Today, however, with the land built up by silt from flooding, with drainage, and with flood protection, the plain has become one of the main sources of dairy produce, fat cattle, lambs, meat, wool, wheat, potatoes, and market garden produce in Otago. Because the area supplies a nearby city market, the type of farming has become much more varied than would be the case if the plain were isolated. The climatic variation throughout the Taieri County is fairly wide, but there is a long winter period. Rainfall is adequate (from 28in. to 35in. annually) and well distributed. Drought or local flood rain is experienced infrequently so that there is less uncertainty associated with pasture growth or the production of fodder and root crops than under average New Zealand conditions.

The farm which it is intended to discuss is situated on land which represents an average cross-section of the plain and is about 2 miles south of Outram, close under the hills on the west extremity of the Taieri Plain. Though highly fertile the land is not as free from frost or as well drained as the small area round Outram which supplies a large proportion of the vegetables for the Dunedin markets. Moreover, the sand fraction is less and the permanent water-table higher. The soil does not warm up as early in the spring, nor does it recover from heavy rains as quickly as the area which is totally devoted to market garden pursuits. It is, nevertheless, productive farming soil, typical of those which have made the Taieri Plain a valuable farming area.

The farm is of 105 acres, flat, easily worked, and well subdivided. The main income is derived from fat lambs, fat cattle, wheat, and potatoes, while crops such as cabbage, cauliflower, and carrots have been grown in the past. The usual feed crops of swedes, chou moellier, and rape are grown and provision is made occasionally for hay, though this is seldom necessary for consumption on the farm. The farm is self-contained and is well worked by the owner, outside labour being required only for harvest and potato picking. There is a suitable range of implements and the sheds, yards, and fences are adequate and well maintained. The implements used on the farm consist of tractor, plough, discs, cultivator, grain drill, roller, ridger, potato planter, potato digger, direct-attached inter-row cultivator and accessories, harrows, lime sower, trailer, clod crusher, small powered cultivator, and seed sower.

The income comes from grain, potatoes, and fat stock. The turnover of fat stock is considerable and the total annual carrying capacity is quite satisfactory considering that of the total area of the farm approximately 30 acres, or nearly one third, is under cultivation. A great deal of reliance is placed on pasture production.

Cropping Programme

Though not comparable with that undertaken in the arable districts of the South Island, the cropping programme is carried through efficiently and the area of the farm used for crops is a good proportion for the Taieri district. The excellence of the arable work done is reflected clearly in the results obtained.

Wheat

The acreage in any crop varies from year to year, depending on the size of individual paddocks and on requirements, but an average of about 12 acres of wheat is grown annually. The average yield is 70 bushels per acre. Failure of the wheat crop or a poor harvest is rare. Certified seed is always used and since the inception of certification Cross 7 has been grown.

Though circumstances may alter the rotation practised, the farmer has definite preferences in relation to the place each crop should occupy. It is usual to grow wheat after lea or after potatoes rather than potatoes after lea. The chief reason for this is that it is difficult to work heavy lea land to obtain the necessary fine working tilth required for the potato crop; it is much easier to prepare lea for wheat. The land is deep ploughed (7in.) in the autumn and the furrow left until August, when it is worked down, chiefly with discs, harrows, and roller.

Swedes are grown regularly for feeding off from June to September.

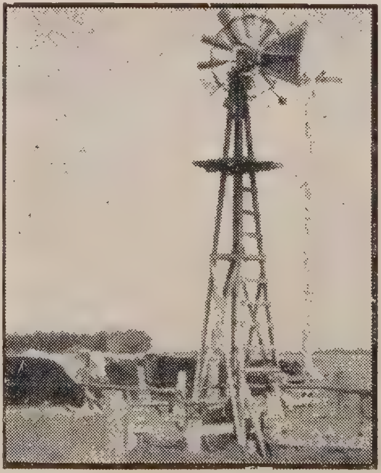
There is no set rule as to how much work is necessary; the aim is to prepare a firm, fine seed-bed. On this farm the seed-bed aimed at for wheat is much firmer and finer than is usual—the type of soil and the free drainage make this possible—but results warrant such a preparation for spring-sown wheat in this area. Wheat is sown in September at the rate of 2½ bushels per acre, with up to 3cwt. of grain manure per acre. The area is then harrowed and rolled. Two crops of wheat are never grown in succession, first because it is a general practice on this farm to grow potatoes instead of a second wheat crop, and secondly, because of the advent of eyespot disease, growing two consecutive crops of wheat is not usual now, as the second has proved too unreliable owing to an increase in infection. With the labour position to consider, the practice is to direct head the crop when possible.

Potatoes

Some 6 to 7 acres of potatoes are grown annually. These generally follow wheat or, on occasions, rape. The varieties grown are King Edward and Inverness Favourite—the area in the latter has tended to increase—and the average yield is 10 tons of table potatoes and 4 tons of seed per acre. The relatively-high yield of seed potatoes is accounted for by the fact that this grower has established a reputation as a producer of high-quality, good grade Certified seed. The seed purchased for sowing on the farm is Certified Mother seed of a high group, fairly large (usually 3 to 4½oz.) potatoes being planted. The King Edward seed comes from the south and the Inverness Favourite from North Canterbury. About 1 ton of this class of seed is required to plant an acre.

Thorough cultivation is necessary to assure success with the potato crop. The wheat stubble (or rape area) is deep ploughed (7 to 8in.) in the autumn, and a second and sometimes a third ploughing is carried out. The area is then worked with discs, grubber, clod crusher, and harrows until a really-fine, deep tilth is obtained. The depth of tilth is important, as it governs the quality of the ridge that can be raised subsequently. Potatoes are planted by machine in 32in. ridges, with the seed 15in. apart in the rows. Seed is invariably planted early (usually September), which accounts in no small measure for the relatively-few poor crops grown on this farm.

The first cultivation after planting is done with the scuffler and the ridges are then harrowed down. When potatoes come through they are first scuffled very close and then hand hoed, scuffled, and worked for half moulding. Fertiliser—a mixture of 3 parts superphosphate, 1 part sulphate of ammonia, and 1 part sulphate of potash (all by weight) is considered best—is applied, after working and before half moulding, at 10cwt. per acre when this is possible. At present a lighter dressing is used. The time of application is unusual, but so far it has given better results than sowing manure with the tubers. By using tines in front of the mouldboard wings (the tractor has an attachment for this) in the final moulding up a very deep, high mould is achieved. The aim is to have a good slope on the sides, plenty of depth between ridges, and the ridges coming to a sharp point at the top. The importance of the final mould on the potato crop is not fully realised by many growers and too often the moulding is not well done, insufficient tilth is produced between the ridges before moulding, and the tops of the ridges are left flat and open.



Throughout the Taieri Plain water for stock can be obtained readily from comparatively-shallow wells.

Digging of the crop, for which a power digger is used, usually begins in May. Table potatoes are marketed immediately, but potatoes to be sold as seed are stored for grading during the winter. At one time three grades were made, but two (seed 2oz. to just over 3oz. and seed 3½oz. to just under 5oz.) are now considered sufficient.

As the potatoes are grown in a warm, sheltered climate on soil of good fertility and generally yield heavily, some difficulty is experienced in keeping the cropping power of the lines up to a high level. For this reason the seed is changed frequently and usually not more than three crops are taken from each line of seed introduced.

After the potato crop is lifted the tops are chain harrowed and burnt and the ground disced and ploughed in readiness for the spring root crop.

Fodder Crops

Swedes and chou moellier: Not a great area of fodder crops is needed, 2 to 3 acres of both swedes and chou moellier on the average being grown. The swedes grown are mainly Superlative or Grandmaster and are ridged at 14oz. of seed to the acre. The chou moellier is also ridged, about 1lb. of seed per acre being sown. Cultivation for these crops consists of ploughing in early spring and working the soil down for sowing about the end of October. The amount of work necessary varies greatly with different seasonal conditions, but the ease and rapidity of the spring work are assisted by the position of this crop in the rotation. Proprietary mixed fertiliser is used, at the rate of 3cwt. per acre and upward. The practice on this farm is to put up ridges when using the fertiliser and to ridge a second time when sowing the seed. Though single ridging is normal and is generally satisfactory, the double ridging is considered a good method of securing a quick, even strike and so minimises the risk of failures.

Both swedes and chou moellier are scuffled and thinned and the scuffler is kept going to free the soil, conserve moisture, and check weeds throughout the early growth of the crop. The final scuffling is undertaken when the crops are almost meeting in the ridges.

Fodder crops are fed off in breaks, commencing in June and continuing until September. The breaks run across both the chou moellier and swedes so that they are fed together. Almost the whole of the crop is used for wintering sheep, but if it becomes necessary to feed to cattle swedes are pulled and fed out. On an average the swede crop yields 55 tons per acre and the chou moellier 40 tons per acre.

Rape: About 10 acres of rape, which yields in the vicinity of 30 tons per acre, are grown each year, the variety used being Broad Leaf Essex. The position of rape in the rotation fluctuates more than that of other crops—it may follow lea, wheat, or potatoes, depending on the ground available. The crop is sown in November on a well-prepared seed-bed at 4lb. to the acre in 7in. drills. Rape is used for fattening bought-in store lambs during February and March.

The fattening of forward 3-year-old bullocks provides the main source of revenue from cattle.

Pasture Management

Of about 30 acres under cultivation on this 100-acre farm about 10 acres come out of pasture every year and about 10 acres are sown out. Pastures are sown out without a cover crop and the land is very well worked before sowing—usually autumn ploughed and worked from August until sowing in November or December. Adequate weed control and excellent consolidation are aimed at. The pasture mixture used, which has given satisfactory results for many years, is as follows:—

	lb. per acre
Perennial ryegrass	30
Italian ryegrass	10
Timothy	3
White clover	3
Red clover	3
Alsike	3
Total	52

Sowing out to pasture usually follows wheat in the rotation, the stubble being autumn ploughed. This is a very suitable practice on the Taieri Plain, as it permits early ploughing following the harvest and allows plenty of time for spring working to give adequate weed control and a suitable seed-bed. Perhaps more emphasis is placed on good pasture establishment on this farm than on the majority in the Taieri County and the results achieved prove that the methods employed should be adopted elsewhere. Planned work and adequate cultivation are the key to success in establishing pastures. Where pastures are kept relatively young, but are nevertheless required to produce at a high level, the time and expense involved in giving them a good start are well repaid. In fact good establishment can be considered the most important step in all pasture management.

The young pasture on the farm under discussion is limed (1 ton to the acre) in January or February of the first year. Thereafter 1 ton to the acre is applied at intervals of from 3 to 4 years. The amount of work and the quantity of fertiliser used during the cropping rotation are considered adequate to start the young pasture, but, if necessary, topdressing with fertiliser is done in later years.

The first grazing of new pasture is made with sheep in January. Sheep firm the ground for the cattle which follow them, but where possible in all subsequent grazings sheep follow cattle. Rotational grazing is practised. (The class of stock used readily permits this.) Stock are never left on a paddock for more than a week and there is always one paddock between each lot of stock. This means that cattle graze the pasture for a week, it is spelled for a week, and then grazed by sheep for a week.

Pastures are harrowed twice a year (using tine harrows and a rail) to spread droppings and they require topping every season, generally in February. Pastures are topped after being very heavily stocked for at least a week. Usually topping consists of cutting off surplus seed growth, but on this farm the pasture is cut very low to get rid of all the growth the stock would not eat.

As it is seldom required for winter feed, hay is saved only occasionally. Control of weeds in pasture is not a problem on this farm because of the careful preparation of the land before it is sown out, but chipping of Scotch and Californian thistles may be done, largely, the owner states, to preserve a good appearance. Pastures are well drained by open drains round all paddocks and by tile drains on the high ground.

Drainage and flood protection have converted the Taieri Plain from a wilderness of rushes and niggerheads to a highly-productive farming district. This photograph shows a contour channel which collects the run-off from the adjacent mountain range and carries it to a lake at the bottom of the plain.

Stocking Programme

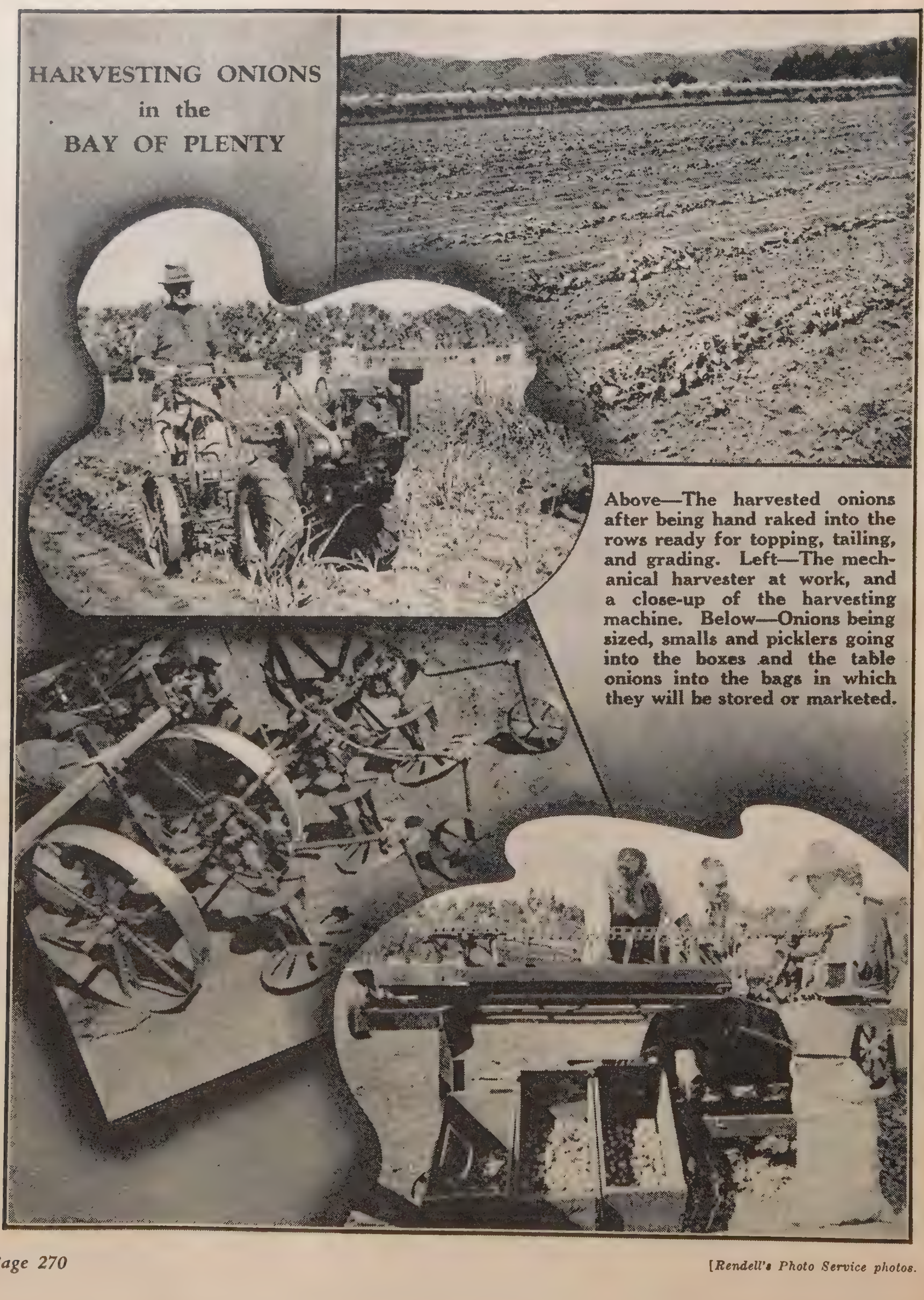
Up to this point the practices described can be followed by all farmers—the cropping programme is good, the rotation is sound, and the method of growing the crops and establishing and managing pastures is excellent.

However, the stocking programme followed on this farm is not typical of the district and would not meet the requirements of all farmers; but it has much to recommend it for the few who can carry it out. For that reason it is intended to deal only briefly with the system of stocking. The farm fattens heavyweight cattle for the butchery trade and apart from the house cow no female stock are necessary. The average annual turnover is about 750 sheep, mainly lambs, and 50 head of cattle. Sheep are bought from November to March and remain on the farm for an average of 2 to 3 months, the main disposals being made in April, May, and February. The lambs preferred are well-forward stores of Romney-cross type and occasionally some 200 of these are bought in March as hoggets. Two-tooth wethers form a proportion of the bought-in stock.

Cattle are bought in the spring—from August to November, depending on the feed position and on markets—and are sold usually in June and July. Three-year old bullocks, preferably of Shorthorn types, are purchased and are generally well forward. Stock seldom have to be kept longer than proposed and the death-rate is negligible.

It is essential to provide good feed for the system of stocking described, but with the first-class, high-producing pastures, most of which are young, and supplementary feed and root crops, an adequate return is possible without involving too many management and labour problems.

HARVESTING ONIONS
in the
BAY OF PLENTY



Above—The harvested onions after being hand raked into the rows ready for topping, tailing, and grading. Left—The mechanical harvester at work, and a close-up of the harvesting machine. Below—Onions being sized, smalls and picklers going into the boxes and the table onions into the bags in which they will be stored or marketed.

[*Rendell's Photo Service photos.*

Mechanisation of Onion Growing in the Bay of Plenty

By J. E. HUME,
Orchard Instructor, Christchurch.

THOUGH Canterbury, Manawatu, and Pukekohe are the recognised main commercial onion-growing districts of New Zealand, the Bay of Plenty has been producing from some of its fertile land small quantities of good-quality, long-keeping onions. During the war when increased production was called for, these areas were extended and now the annual production exceeds 500 tons of onions from about 50 acres in Te Teko and Katikati districts.

[*Rendell's Photo Service photo.*

Onions on the homestead block. About 10 tons are harvested from this half-acre.

THE first area of any size was 8 acres planted in Te Teko by Mr. John Cannell; this followed the planting of about half an acre in front of Mr. Cannell's house which yielded more than 10 tons the previous year and showed such good promise that an extension in area was immediately planted. The soil in this locality consists of a 6in. layer of Tarawera ash overlying a stratum of fine sand on about a foot of good peat, with pumice subsoil beneath.

Land Preparation

During the first few years of onion growing on this farm land preparation was carried out by tractor and consisted of one ploughing, rolling, harrowing, and then a second rolling, the seed being sown with single-row seeders pushed by hand. Row weeding was done by hand with Maori labour and inter-row weeding with hand-pushed hoes. Harvesting was also done by hand, together with the topping and tailing of the onions, whereas today the whole job is almost completely mechanised.

The same land preparation is carried out, but instead of seed being sown with hand-pushed seeders a gang of three seeders is drawn by a small two-wheeled tractor, sowing an acre in 1½ hours, the rate of sowing being 3lb. to the acre in rows 12in. apart. This work is usually carried out in late August or early September.

Manuring varies in kinds and quantities, the general application being two parts of superphosphate, two parts of bonedust, and one part of potash, applied at between 6 and 10cwt. to the acre at the time of seed sowing.

Mechanical Weeding

The crop is kept free from weeds by mechanical weeders, which are used about eight times during the life of the crop.

These weeders are drawn by the tractor used for sowing. This is important, as it is fundamental in row-crop cultivation that the weeders must be exactly the same distance apart as the seeders to avoid overrunning and killing some of the onions. Careful driving of the tractor is also essential for maximum efficiency from these ingenious little weeders with the minimum of damage to the onion plants.

When the plants are about 1in. high the inter-rows are cultivated with small tines and at the same time a thin layer of soil is thrown against each side of the plant by the use of small discs, which are attached to the tine cultivator. This layer of earth has the effect of smothering newly-germinated weed seedlings and at the same time mounds up the soil to the plant.

When the second crop of weeds shows up weeding is carried out by the use of a series of serrated blades

[*Rendell's Photo Service photo.*

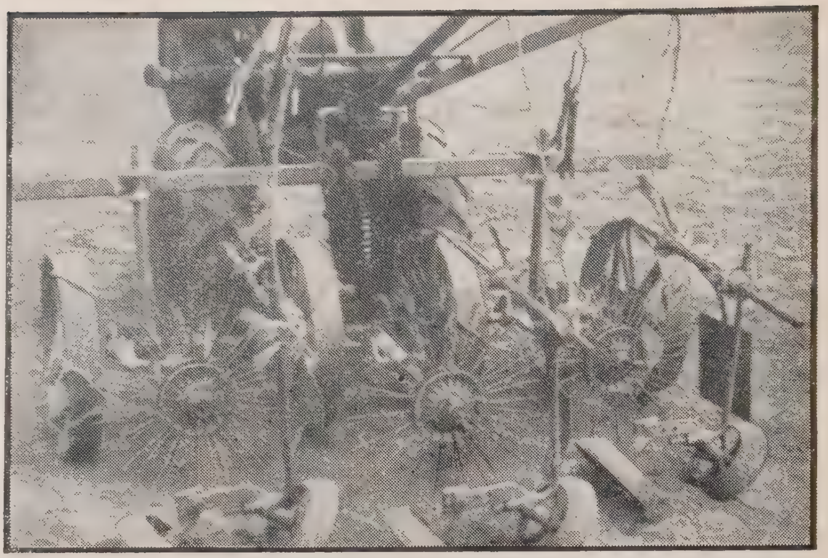
How the mechanical harvester leaves the crop. It has just passed along these rows.

or steel combs revolving on a spindle or shaft. These blades strike alongside the mounded plant with a downward movement, the serrations cutting the weeds away from alongside and between the plants and at the same time thinning out the onion seedlings in the rows to the required distance apart. The blades are spring loaded and can be adjusted to suit the firmness or friability of the soil being weeded. This operation is repeated about a fortnight later, but if growing conditions are good, the equipment cannot be used again, as it is not advisable to use this tool after the little bulbs begin to develop or swell.

From this period on the weeds are kept in check by replacing the serrated blades with a set of weeders that resemble a small cycle wheel with the rim cut away leaving the hub and spokes. These spokes revolve on the same spindle and have the effect of cultivating as well as weeding alongside and between the plants. Usually two cultivations with the serrated blades and six with the spokes are sufficient to keep the field free from weeds up to harvesting.

Hand weeding has to be resorted to once or twice during the growing season to remove the few deep-rooted weeds left by the cultivators. This work is simplified because the soil around the weeds is friable and pulling out the individual weeds is easy. Hand weeding has not exceeded two man-days an acre for the crop since mechanised weeding has been applied.

With either set of weeders it is quite simple to weed an acre efficiently in 1½ hours, compared with a minimum of 70 man-hours an acre for hand weeding—an excellent example of the value of mechanisation and the extent to which machines can be adapted to do work usually regarded as hand work.



[Rendell's Photo Service photo.

Spoke or thin-tine circular weeders.

Harvesting and Grading

Harvesting is usually begun early in March. The old method was to pull the onions and let them lie for 10 to 14 days to dry. Topping and tailing was usually done with shears, either in the field or in the sheds later in the year. With mechanical harvesting the same tractor and drawbar are again used, fitted with a series of three inverted steel saucers set close down on the ground and revolving during travel. These cut under the bulb of the onion, lift it, and at the same time push or throw two rows into one. For ease of gathering, two of these double rows are hand raked together and the bulbs are allowed to mature, which usually takes up to a fortnight.

The onions are then gathered up into crates and taken to a portable mechanical topper, tailer, and sizer stationed in the field. This piece of equipment is about 4ft. high, 4ft. wide, and 8ft. long and is belt driven by a power take-off from the tractor. On one side of the grader is a hopper that feeds on to a set of four rollers, each of about 3in. diameter. The rollers are in pairs rotating inward, and on each roller is a curved strip of steel running its full length, giving the effect of a long gradual thread. Each strip is raised slightly above the surface of the roller, with its hollow side facing the roller surface. As the rollers revolve these strips of steel have a drawing effect on the tops and tails of the onions, and, as they pass along, the edge of the curve serves as a cutter and makes a good job of trimming them off.

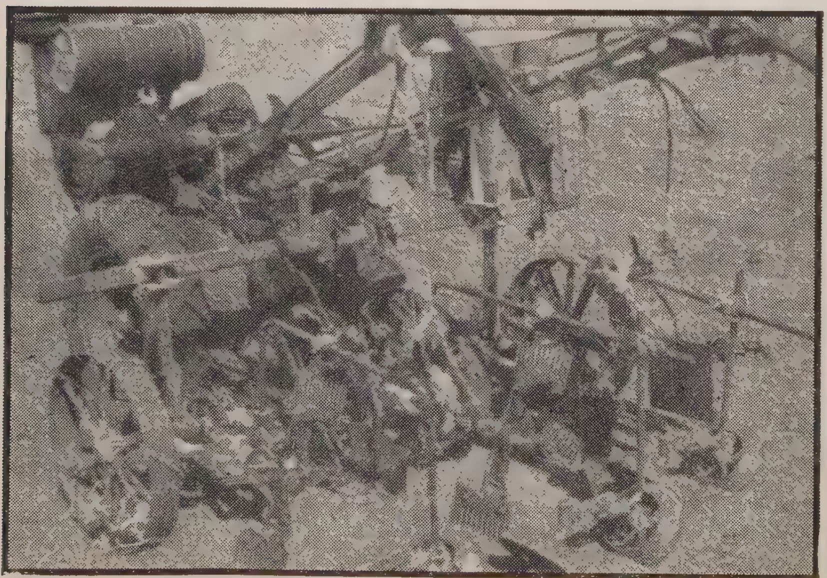
From the hopper the onions travel along one side on the trimming rollers and are brought back along the opposite side by a travelling belt. There they are graded for size, the smalls and picklers dropping through first, the others going on into their size grades.

Including the carting from the field to the grader, four men have graded, bagged, and sewn ready for dispatch 14 tons of onions in one day.

Onions that have been mechanically harvested, put over the grader, and bagged have kept for appreciable periods, showing no sign of decline in keeping quality through being put over the machine.

Progress of Industry Assured

Onion growing with hand weeding did not offer much promise of expanding in the Bay of Plenty, but with the mechanisation of the industry its progress is assured. Provided care is taken not to operate these machines in sticky soil or on uneven surfaces, they are efficient units for the onion grower and in some areas in this district are being used on a co-operative basis.



[Rendell's Photo Service photo.

Serrated-blade or comb type weeders.

How The Cow Releases Her Milk

By W. G. WHITTLESTON, Physical Chemist,
Department of Agriculture Animal Research Station, Ruakura.

THE object of this article is to describe just how the milk flows out of a cow when she is being milked by machine. Methods of recording the way the cow milks have been worked out and are being applied at the Department of Agriculture's Animal Research Station at Ruakura to a study of the milking process. These studies have produced very interesting results, some of quite a practical nature. It is these which will be examined.

WHEN the attempt to discover how various conditions influence milking was begun the first problem was to make an apparatus which would draw a curve automatically. This had to be done without upsetting the ordinary shed routine and in a way which did not require any strange people pottering about the cowshed. It was decided to plot the volume of milk given against the time taken to give it.

The Apparatus

The measuring unit is a cylinder fitted with a row of 50 stainless-steel studs spaced at about ½lb. intervals (.54 to be exact). These studs are connected by a telephone cable to an electrical recording instrument out in the separator room. The time is recorded automatically by an electric clock which drives the recording pen across the paper and is started or stopped by the vacuum at the cups. By this means a curve like Fig. 1 is obtained. This is the "milk-ejection curve" of a typical cow. Notice how it is made up of three different parts: a, the starting curve; b, the straight part during which most of the milk is given (the milking curve), and c, the "stripping" part which indicates a slow milk-flow rate.

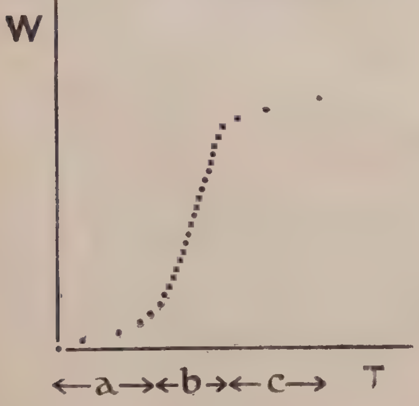


Fig. 1.

These different pieces of the milk-flow curve will be discussed in turn.

A. The Starting Curve

An attempt to milk a cow which has not let down her milk will have a result like Fig. 2. The starting part a takes up 2 or 3 minutes in a bad case. This is a waste of time because the milk flow during this time is only a trickle. It is interesting to note that if the cups are pulled or weighted during this phase, quite a distinct flow of milk may be obtained for about a minute. This is due to the emptying of the "milk cistern." However, when the cups are not pulled they "crawl" up the teats and practically block off the flow. (This is the effect which gives rise to "machine strippings," which will be discussed later.) Fig. 3 illustrates the effect of pulling the cups at the beginning of milking before the cow has let down her milk.

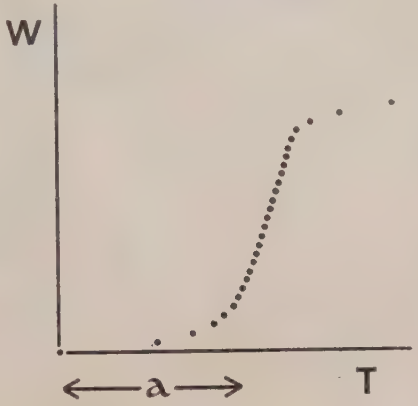


Fig. 2.

It is quite evident that a lot of time can be wasted if the cow has not let her milk down before the teat-cups go on. It will also be evident that the cups by crawling up the teats and sucking away at an unresponsive udder may damage the delicate tissue lining the udder and make it susceptible to disease.

For fast, safe milking the milk must be down before the cups go on.

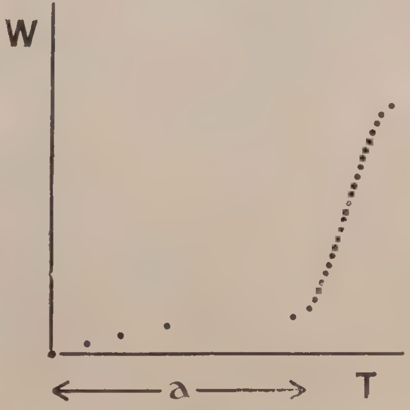


Fig. 3.

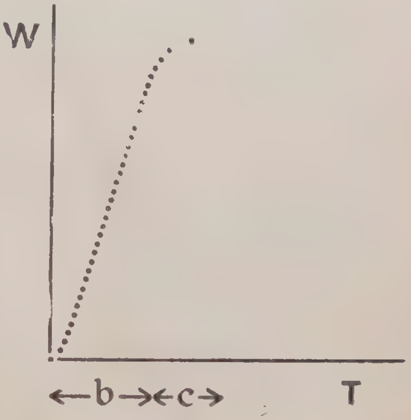


Fig. 4.

B. The Milking Curve

Previous experiments have shown that when a cow is correctly stimulated a substance is secreted into the bloodstream which causes the cow to eject her milk. If the cow has been correctly stimulated, an ejection curve like Fig. 4 is obtained.

The milk flows as soon as the cups go on. **There is no starting curve.** What factors can affect this milking curve? It has been found that by partly inhibiting the letting down of the milk by using an electric shock a result like Fig. 5 is obtained.

In other words less milk is obtained in a longer time. The same bad result can be obtained by starting the cow too long before the cups are put on. The reason is probably the same in both cases. When the cow is upset (or inhibited) she does not release enough of the let-down substance, while if she is kept waiting too long, the substance is destroyed in the blood and there is not enough left to do the job properly when the cups are put on.

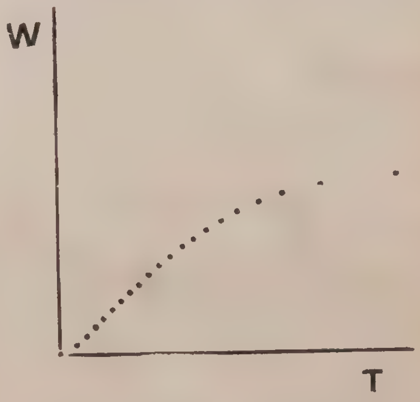


Fig. 5.

What happens to the rest of the milk? It is still in the udder and if not removed most, but probably not all, of it will be obtained at the next milking. If much is left, it will cause the pressure in the udder to rise too high and stop the secretion of more. On the other hand if the cow is hand stripped or vigorously machine stripped, the additional stimulation

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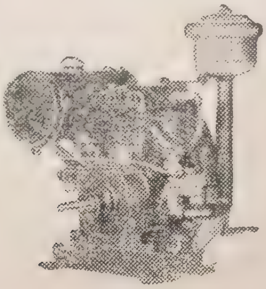

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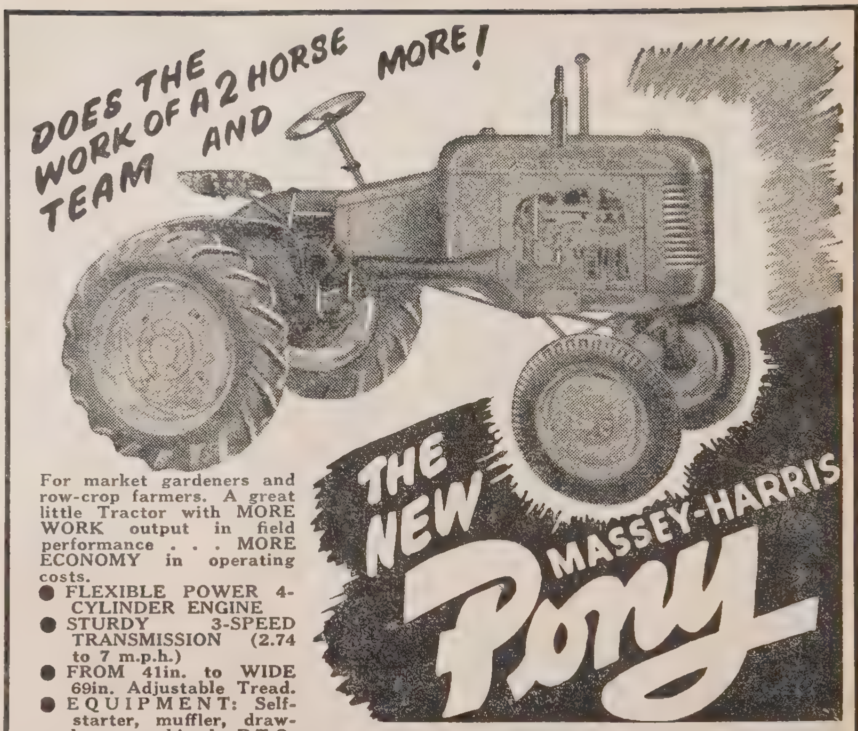

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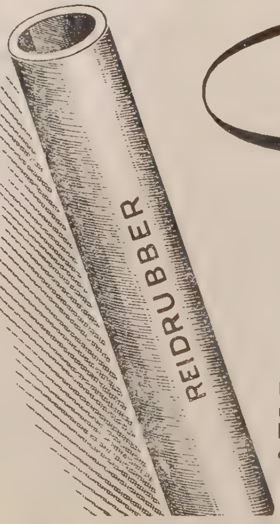

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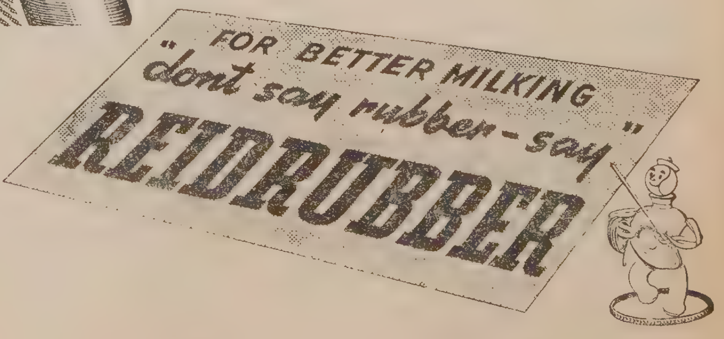

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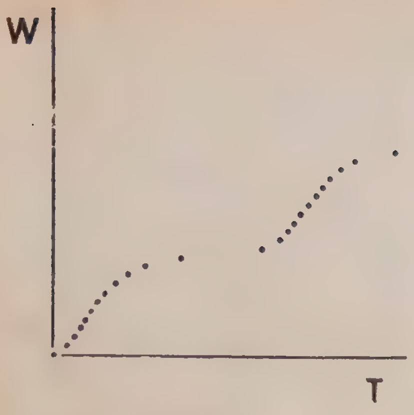


Fig. 6.

will cause a further release of milk let-down substance and hence a further flow of milk.

Fig. 6 shows the curve for a cow which had not properly let down her milk at the start of milking, but finished off the job by a second letting down when she was machine stripped.

C. The Stripping Curve

The third part of the milking curve has now been reached. A normal cow milked by machine without any "machine stripping" gives a curve like Fig. 1. In many cases, if the cups are pulled toward the end of milking, a curve like Fig. 7 is obtained.

When the cups are pulled there is immediately a short burst of flow. This is due to the cups having crawled up the teats, so closing off the bottom of the milk cistern. When the cups are pulled what milk has been trapped can now be drawn. The amount of milk left due to this cause is normally not large. It was found at Ruakura that the average machine strippings for 12 cows for one season was about ¾lb. of milk per milking. This is probably not worth worrying about.

If the farmer adopts a vigorous machine-stripping procedure, involving the massaging of the udder and so on, instead of getting the small amount of milk represented in Fig. 7, he may find some of his cows starting to release a second lot as in Fig 6. In other words, just as, by using a faulty starting procedure, a cow can be trained to let her milk down a second time to hand stripping, so machine stripping may become a strong enough stimulus to result in a second flow of milk.

Before discussing the effect of milking methods on the milk-ejection curve as a whole one practical point should be discussed. The reader will have noticed that the normal milk flow curves (Figs. 1 and 4) end very soon after the straight-line part curves over. This means that the cow has finished milking very soon after the milk-flow rate has started to change. This led to the construction at Ruakura of a sight glass for accurate experimental work which stays full of milk until the rate falls to ½lb. of milk per minute; then it clears quite quickly. In other words it is found that the great majority of cows tested so far at Ruakura are milked out when the milk-flow rate has fallen to ½lb. of milk per minute. It is hoped that before long a commercial version of the flow-indicating sight glass will be available. The ordinary sight glass has been found to give a deceptive indication of the end of milking. Even when the flow has fallen to less than ¼lb. per minute, due to frothing and splashing there is a distinct indication of milk passing. Because of the low slope of the stripping part of the milk-ejection curve, this low flow may persist for quite a while. In other words much time may be wasted if the sight glass does not indicate when the milk flow has started to fall. **A good sight glass can mean quicker milking and less danger of damage to the udder, because the cups are not left on when the milk flow has practically ceased.**

EFFECT OF MILKING METHODS ON MILK-FLOW CURVE

It will be evident from what has been discussed so far that the way a cow is handled will have a big effect on the shape of the milk-flow curve. In Fig. 8 are shown the effects of a milking technique which is faulty in almost all respects. This cow had been inhibited by an electric shock and had been trained to a vigorous machine-stripping procedure. It has been found that if a cow is chased around the yard or upset due to a fall, the same effects as from an electric shock will be produced. The causes of this very poor milk-ejection curve are:—

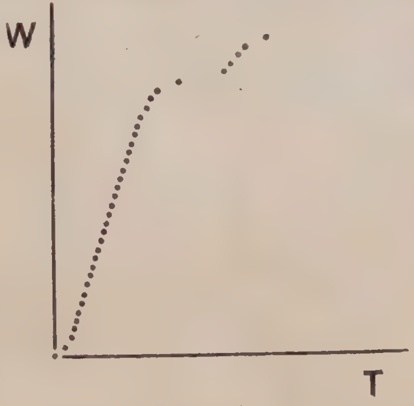


Fig. 7.

1. The cow had not let her milk down before the teat-cups were put on.
2. The let-down is not definite enough, probably because the cow has been trained to vigorous machine stripping as well as to the effect of the shock.
3. There is a second let-down of milk when the machine stripping is started.

At this point the fact that the multiple ejection of milk is not an abnormality should be stressed. The natural cow was expected to release her milk in small doses to the calf from time to time. The unnatural is being expected in asking the cow to produce enough pituitary substance at each let-down to get all the milk out in one lot. However, most cows may be trained to do so.

To convert a poor curve like Fig. 8 into a good one like Fig. 4 the following steps must be taken.

1. The cow must be adequately stimulated at the start. It is found at Ruakura that if the cow is thoroughly washed with water at ordinary temperatures, a squirt taken from each teat into the strip cup (a necessity when hand stripping is not practised), and then the teat-cups are put on, the milk will be let down in practically all cases. The adoption of a regular shed procedure will ensure a regular letting down. The starting procedure should take about a minute.

2. The cows should be milked by a machine fitted with a good sight glass, no gadgets, and a vacuum of about 14 to 15in. of mercury. This will ensure that the routine is not upset by the cups falling off and that the milk is taken away as fast as it is drawn. A pulsator with a regular rate between 35 and 45 pulsations per minute and a ratio of about 25 : 75 is suggested.

3. As soon as the milk-flow rate falls to ½lb. a minute the cups should be pulled downward for, say, half a dozen pulsations in the case of the cows which are known to need this treatment, and when the sight glass clears again the cups should be removed. All vigorous machine stripping should be avoided except in special cases.

Experiments at Ruakura show that when such a procedure is used there is no advantage in using warm or even hot water for washing the udders as a general procedure. The use of a hot-water wash is useful in training cows which have developed bad habits. The double milker (Fig. 8) discussed above was made into a good milker again by using a hot-water wash, but once she was back to normal she responded to normal treatment again. About a fortnight's training was needed.

Occasionally one finds a cow which, despite good starting methods, does not milk out completely to the machine. This sort of cow (like her ancestors?) does not seem to be able to secrete enough milk let-down hormone to enable all of the milk to be drawn. There are three solutions to this problem:—

1. If she is a poor producer, sell her; she is not worth the trouble she causes by upsetting the shed routine.

2. Hand strip her; this is hard work.

3. Use a vigorous machine-stripping method; by adequate massage such a cow will be stimulated to a second secretion of let-down substance and so more milk will be obtained.

Attention should be drawn to the fact that many farmers who say they do not strip are really "machine strippers." Any vigorous, stimulating,

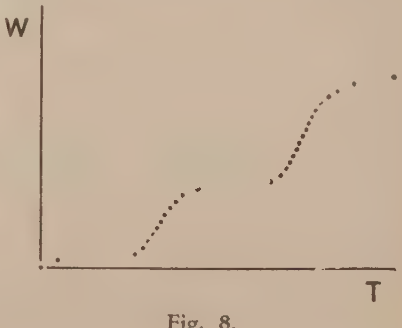


Fig. 8.

post-machine-milking procedure is really stripping. The aim should be complete non-stripping with simple cup pulling only in cases which are found to need it. By good starting the majority of cows will milk out without further stimulation. In problem cases vigorous machine stripping may be used to supply the second stimulus; it has been found that such stripping takes about as long as hand stripping, but it is more hygienic and a less objectionable operation.

Sometimes it is difficult to distinguish between "simple cup pulling" and real "machine stripping." The real test follows from the fact that the milk drawn due to simple cup pulling is usually small in quantity and **the flow starts immediately.** In the case of the real "machine stripper" there is an immediate flow of a small amount of milk followed by a larger flow due to the letting down of more milk, a process which is delayed by the ¾ of a minute required for the hormone to reach the udder after the stimulus of stripping has taken effect.

The requirements for good, normal machine milking can be summarised as follows:—

1. **Maintain a regular shed procedure.**
2. **Wash each cow and take squirts from each teat into a strip cup; apply the cups without delay.**
3. **Milk at a vacuum of 14 to 15in., using a reliable pulsator with a rate of 35 to 45 and a ratio of 25 : 75. Use a good sight glass.**
4. **When the milk flow falls (to about ½lb. a minute) give the cups a non-stimulating pull if needed and remove them when the glass is again clear.**
5. **With problem cows hand stripping can be eliminated by vigorous machine stripping.**

☆

PEDIGREE SOW RECORDS

DURING the four months September to December, 1948, 22 of the 27 litters recorded were sufficiently good to be included in one of the five grades set out below:—

Grade	Minimum litter weight	
	At 3 weeks	At 8 weeks
1	120lb.	360lb.
2	100 ,,	300 ,,
3	90 ,,	270 ,,
4	80 ,,	240 ,,
5	70 ,,	210 ,,

Contributed by the Livestock Division.

Breed Averages for the Period

Breed	No. of litters recorded	Litter weight at		Number of pigs		Average weight at	
		3 weeks (lb.)	8 weeks (lb.)	Born	Weaned	3 weeks (lb.)	8 weeks (lb.)
Berkshire ..	8	100.5	295.5	10	8	12.56	36.94
Tamworth ..	3	79.0	287.0	8.7	7.3	10.77	39.14
Large White ..	15	116.5	396.1	13.1	10.3	11.27	38.33
Large Black ..	1	121	338	10	9	13.44	37.56

A No. 3 grade is regarded as good, No. 2 excellent, and No. 1 as special.

The following list gives the names and addresses of the breeders of recorded sows and details of the litters:—

Owner's name and address	Herd Book No. of—		Litter weight at		No. of pigs		Grade of litter
	Sire	Sow	3 weeks (lb.)	8 weeks (lb.)	Born	Weaned	
Berkshire							
Ellerm, O. C., R.D., Palmerston North	22742	22550	124	351	11	10	2
Revell, A. W., Mangatoki, Taranaki	22934	21317	88	242	9	7	4
Revell, A. W., Mangatoki, Taranaki	23652	22899	123	365	11	9	1
Revell, A. W., Mangatoki, Taranaki	22934	21318	123	416	11	9	1
Horsham Downs Pig Club, (secretary, C. G. Haultain, Horsham Downs, R.D., Hamilton)	21532	22485	123	369	10	10	1
Dewhurst, C., Puni, Pukekohe	23515	21373	89	196	11	7	—
Dewhurst, C., Puni, Pukekohe	22825	22502	70	158	10	5	—
Pohangina Pig Club (secretary, T. J. Spelman, R.D., Ashhurst)	22900	19540	64	267	7	7	
Tamworth							
Hamilton, Mrs. B. W., Waikakahi Settlement, Grassy Hills, R. D., Waimate	14994	14888	114	359	8	7	2
Fredrickson, G. D., Te Whiti, R.D., Longbush, Masterton	16060	16048	58	219	9	6	—
Pohangina Pig Club (secretary, T. J. Spelman, R. D., Ashhurst)	14049	15673	65	283	9	9	-
Large White							
Montgomerie and Bell, Ardmore, Papakura	6956	6689	253	964	16	15	1
Montgomerie and Bell, Ardmore, Papakura	6144	6612	105	400	16	8	2
Levin Pig Club (secretary, P. B. Bartholomew, P.O. Box 14, Levin)	7537	7324	94	308	10	10	3
Anderson, C. B., R.D., Bulls	6829	6825	100	302	13	9	2
Johnson, L. A., P.O. Box 23, Murchison	7373	7377	124	463	12	12	1
Vickers, H. E., P.O. Box 554, Hamilton	6720	6911	91	403	14	10	3
Hickey, G. W., and Sons, Kariotahi, Waiuku ..	7161	6938	130	312	18	10	2
Rowlands, T. E., Ruthin, R. D., Kaiapoi	7992	7253	89	280	9	9	4
Rowlands, T. E., Ruthin, R. D., Kaiapoi	7992	7254	89	250	9	7	4
Davies, T. L., Ngahinepouri, R.D., Ohaupo	(Berk.) 19626	7591	127	428	11	11	1
Bunyan, W. G., Spring Glen, R.D., Whakatane ..	7509	7189	124	415	14	14	1
Webber, M., Frontier Road, Te Awamutu	6427	6257	85	255	8	8	4
Broadmore, F. E. J., R.D., Whakatane	7318	7034	103	369	13	8	2
Spackman, L. S., 501 R.S.A. Buildings, High Street, Auckland	7162	7170	129	399	17	12	1
Spackman, L. S., 501 R.S.A. Buildings, High Street, Auckland	7162	7209	104	393	17	12	2
Large Black							
Missen, H. E., Powdrell's Road, R.D., Whakatane ..	5008	5366	121	338	10	9	2

SEED PRODUCTION IN NEW ZEALAND

Timothy

By W. L. HARBORD, Fields Instructor, Department of Agriculture, Invercargill.

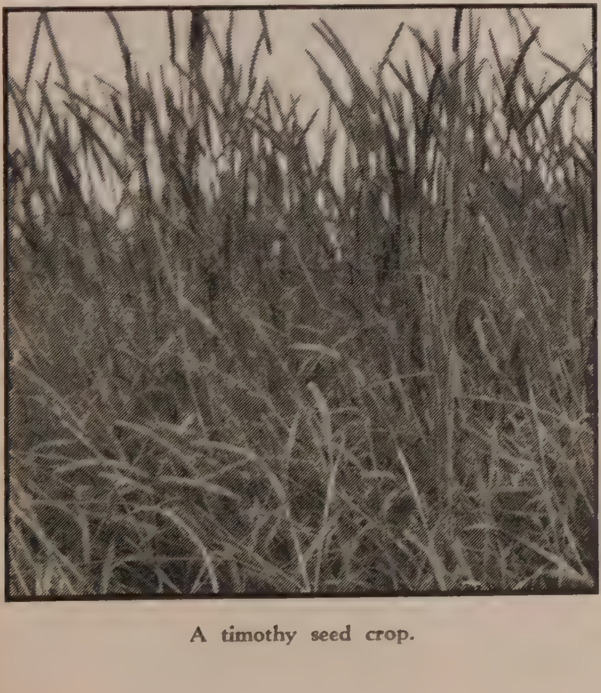
TIMOTHY seed has been included in pasture mixtures in New Zealand practically since the first pasture plant seeds were imported into the country. Known botanically as *Phleum pratense,* timothy is used as a pasture grass in most countries with temperate climates and is a valuable plant in pastures on rich, moist soils throughout New Zealand. It is so palatable to stock that it is frequently grazed so hard that the farmer believes it has disappeared from his pasture. The plant is tufted in habit and the stems are usually swollen at the bases. The flower head is long when grown under good conditions, and somewhat resembles that of meadow foxtail, though that of the foxtail ripens much earlier. It is a hardy plant, resistant to frost damage. Though best suited to moist soils, it does not thrive well under permanently-waterlogged conditions.

STATISTICS of New Zealand production of timothy seed are available only from 1946. It is reasonable to assume that the annual acreage harvested before that year was not great, and that farmers depended very largely on overseas sources for their supply of seed. More than 90 per cent. of the imported seed has come from the United States of America, which seed could be landed in the Dominion at a cost appreciably less than that for which New Zealand growers were prepared to produce it.

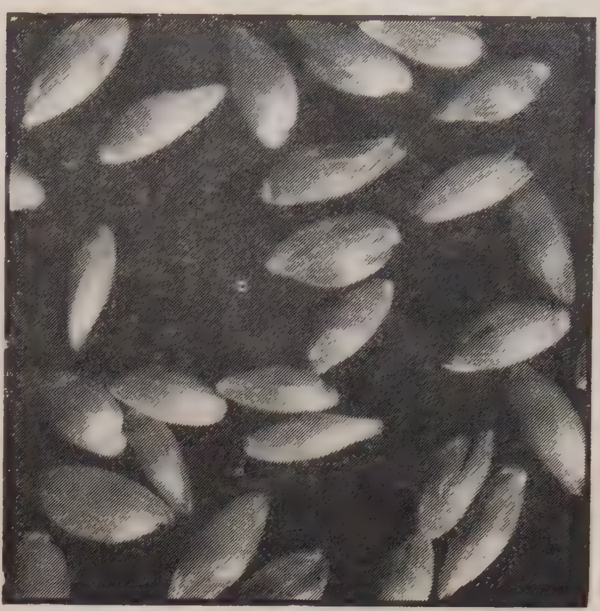
Timothy seed has been produced continually on some Southland farms since 1890, and one paddock after 27 consecutive harvests returned an average yield of 240lb. per acre.

Improvement of Strains

During the war years imports were curtailed somewhat, and as a result some impetus was given to Dominion production. That has been accentuated by the introduction of improved strains of timothy, and now sufficient seed is being saved to meet all New Zealand requirements.



A timothy seed crop.



Timothy seed (about 7 times natural size).

Trials have shown that seed imported in the past generally was of a poor type, particularly in comparison with the strains developed by the Aberystwyth Plant Breeding Station. Seed of New Zealand origin has shown some variation in type, the worst being no better than imported and the best still inferior to the Aberystwyth strains. A line of S.48 timothy seed imported by Lincoln College from Aberystwyth in 1939 formed the nucleus for improved timothy strains in New Zealand, and the work of selection has been continued at Palmerston North by the Grasslands Division of the Department of Scientific and Industrial Research. As a result, a locally-raised pedigree strain has been released recently for multiplication under commercial conditions.

Certification of timothy seed, based on material produced from the introduction made by Lincoln College, was begun in 1945, and the release of the pedigree strain has enabled the establishment of the following 4 classes of Certified seed:—

Government Stock seed: Grown under contract by the Department of Agriculture from nucleus selected material supplied by the Grasslands Division.

Pedigree seed: The produce of areas sown with Certified Government Stock seed.

Mother seed: At present harvested from areas sown with seed once grown from S.48 seed, but later to be saved from areas sown with Certified Pedigree seed.

Standard seed: The produce of areas sown with Certified Mother seed.

Cultivation and Sowing

The soil type most desirable for timothy seed production is a rich, deep loam with a clay subsoil adequately drained. Timothy for seed can be sown at almost any place in a rotation of crops. but it is usual to sow the crop after swedes or turnips have been eaten off by sheep or cattle.

Cultivation before sowing usually starts as soon as the swedes or turnips have been eaten off. A first discing is followed by periodic discings and harrowings until November, when the ground is rolled heavily 2 or 3 times to form

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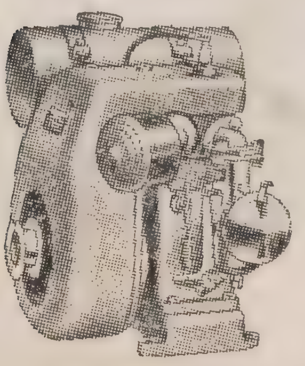

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For seed production in Southland, timothy is drilled at 3 to 4lb. per acre, often with rape.

IMPORTS OF TIMOTHY SEED (tons)

1927 ..	145	1934 ..	90	1941 ..	9
1928 ..	248	1935 ..	206	1942 ..	58
1929 ..	145	1936 ..	142	1943 ..	140
1930 ..	128	1937 ..	119	1944 ..	Nil
1931 ..	89	1938 ..	127	1945 ..	161
1932 ..	136	1939 ..	115	1946 ..	Nil
1933 ..	160	1940 ..	186	1947 ..	Nil

Of the total imports of 2404 tons, the United States of America sent 2182 tons, Canada 118 tons, Finland 36 tons, and other European countries 68 tons. The chief import from Canada was in 1928, when 78 tons were received; 25 tons were received from 5 European countries in 1934 and 61 tons from 7 European countries in 1935.

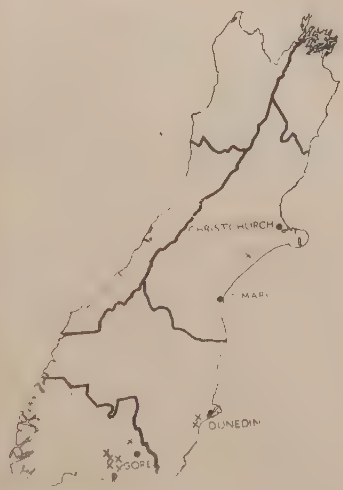
as firm a seed-bed as possible. Good consolidation is essential for a good strike of this crop.

Though the broadcast method of sowing appeared to prove satisfactory in past years, best results are obtained when the seed is sown in 7in. drills at the rate of about 3lb. per acre, compared with as much as 20lb. by former methods. A cover crop of rape is usually sown, 1½lb. per acre usually proving ample.

The crop responds well to liming, and it is as well to apply 1 ton of carbonate of lime per acre before the sowing of the swede crop and another 1 ton during the cultivation preparatory to the sowing of the timothy seed. Superphosphate at the rate of a bag per acre is applied when the seed is sown, and the crop is topdressed annually with a bag of superphosphate and 5cwt. of carbonate of lime.

When sown during November the crop is grazed as soon as the rape is ready, which is about mid-February. It is grazed by weaned lambs until not later than the end of April, after which it is best not grazed during its first winter, but many farmers use the paddock to provide greenfeed for pregnant ewes by about mid-August as a means of combating ante-partum paralysis. Grazing may then be carried on with ewes and lambs until the area is closed for seed production by mid-October, when the annual topdressing of superphosphate and lime should be applied.

Under Southland conditions an area closed to stock by mid-October and topdressed immediately will usuallly be ready for harvest by about March 10—about 145 days after the date of its being closed.



Practically all the timothy seed harvested in New Zealand is produced in the South Island. The crosses indicate the principal seed-producing areas.

TIMOTHY SEED PRODUCTION IN NEW ZEALAND

	1946		1947	
	Acres	lb.	Acres	lb.
Canterbury ..	168	52,091	131	55,205
Otago	271	39,720	282	63,525
Southland ..	683	205,407	978	251,740
Other districts	6	800		
Totals	1,128	298,018	1,391	370,470
Average yield per acre ..		264		266

No earlier figures are available.

Harvesting

To determine when the crop is ready for cutting is simple, as it can be cut as soon as most of the heads are in such a condition that the seed head can be stripped from the stalk when the thumb and forefinger are run up it. If the seed head will not come away, leaving a bare stalk, the crop is not ready for cutting. The crop is usually ripe when the seed has disappeared from the tip of the seed head.

During recent years the header harvester has proved popular with some farmers for timothy harvesting. However, the best method is still that using the binder and allowing the sheaves to stand in stook for from 2 to 4 weeks. Timothy is easily cut with a binder, but it is not an easy seed to thresh, and if a few good downpours of rain fall while the sheaves are in stook, the seed can be threshed more easily.

The tin mill is the fastest machine to thresh this crop, but the old-type large wooden mill with a clover huller attached to the drum does the work best. With a tin mill the sheaf bands are cut and the sheaf allowed to run through, but with a wooden mill the sheaves are held in the drum for a few moments for the seed to be threshed.

QUANTITIES OF TIMOTHY SEED CERTIFIED (lb.)

	1944-45	1945-46	1946-47	1947-48
Christchurch ..	86	2,147	3,957	1,206
Mid-Canterbury		22,675	35,617	13,133
Otago				596
Eastern Southland ..		311	245	1,411
Totals	86	25,133	39,819	16,346

Harvesting timothy seed with a reaper and binder in Otago.

In Southland yields of nearly 1000lb. per acre have been harvested, but a good yield is up to 500lb. of machine-dressed seed.

Ninety per cent. of the New Zealand timothy seed crop is grown in Southland, but most of the Certified seed is at present produced in Canterbury. Seed production is a relatively-new venture in Canterbury, involving in the main the saving of Certified seed from areas established with the superior strains. On one farm in the Eiffelton district of Ashburton County 100 acres has been sown out. This area averaged 222lb. of machine-dressed seed per acre in the 1946 harvest and 349lb. in the 1947 harvest. In 1948 only half the area was saved for seed and yielded 268lb. per acre. The land was used previously for cocksfoot seed harvesting and is of a soil type typical of the large area in this locality used for the production of cocksfoot seed. The timothy was sown with Montgomery red clover, which it quicky smothered over most of the area, resulting in a strong timothy stand. On this farm different methods of harvesting have been tried, and cutting with a binder, stacking, and threshing is considered a better method of saving the seed than threshing with a header harvester from the windrow because of the long time required to condition timothy seed.

The seed is easily dressed, the chief impurities being Yorkshire fog and goosegrass, both of which are easily removed from timothy with modern seed-cleaning machines. In the past white clover was a troublesome impurity in timothy seed, but now, with better management of seed-producing areas, timothy practically excludes low-growing plant life and consequently white clover is not so troublesome.

Use in Pastures

Timothy seed is used in pasture seed mixtures in all localities of New Zealand where the grass thrives. Though it is sown in many pastures, consumption of the seed is not high, as the seed is very small, and seldom is more than 6lb. per acre sown.

Timothy shut up for seed production, with a bottom growth of white clover coming into flower.

Timothy withstands heavy winter poaching—in fact, such treatment is beneficial to seed-producing areas. Stock grazed on such an area during winter are allowed free access to the stacks of threshed straw, and thus much of the nutriment from this roughage is returned to the soil in the form of dung.

Timothy is not troubled to any great extent by fungi or insect pests, but attacks of some consequence have been made by an army worm, *Persectania ewingii*. This caterpillar climbs the stalk and feeds on the seed head, thus reducing the yield.

The production of timothy seed of superior strain to meet New Zealand requirements is a worthwhile undertaking. Whether an export market can also be developed remains to be seen; already some inquiry has been made from overseas for Certified timothy seed.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in April as under:—

Auckland—1YA, on April 26, at 12.35 p.m., "Slipshod Methods with Pigs Won't Do," by C. W. Wallace, Supervisor, Waikato District Pig Council.

Napier—2YZ, on April 8, at 7.15 p.m., "Planning the Breeding Programme," by H. A. Hopkins, Supervisor, Tairawhiti District Pig Council.

Dunedin and Invercargill—4YA and 4YZ, on April 11, at 7.15 p.m., "Schemes in Operation for Benefit of Pig Raisers," by N. Macdonald, Supervisor, Otago and Southland District Pig Council.

CROPS FOR FATTENING LAMBS

IMPORTANT aspects of fat lamb production, such as the methods adopted to obtain a higher percentage of lambs sold as fat off their mothers, and the management of lambs at weaning time, are discussed in this article by M. C. Armstrong, Veterinarian, Department of Agriculture, Timaru. It also describes the utilisation of crops which are used in New Zealand for the fattening of weaned and store lambs.

A MAJOR item on the credit side of New Zealand's national economy is the production of fat lambs for the export market—a farming pursuit which can be undertaken successfully under a wide range of soil and climatic conditions from Northland to Southland. Fat lamb farms can be divided roughly into 2 groups—those fattening the majority of lambs on their mothers, and those fattening the majority of lambs on special crops or pastures after weaning.

On good fattening pastoral country where the early-developing Southdown ram is crossed with good carcass types of Romney ewes, many farms sell about 90 per cent. of the lambs fat off their mothers. The capacity of a farm to fatten a high percentage of lambs on their mothers varies and fluctuates in response to several factors. Excellent fattening country of this nature is able to carry a persistence of suitable pasture growth from September to January—an achievement which is the result of good pasture management on a fertile soil type with a mild climate and regular rainfall. In general, the North Island is favoured with a more suitable climate for this purpose than the South Island, which demands more effort for supplementary feeding and where pasture growth begins later in the spring and runs off to seed earlier in the summer.

New Zealand farms fattening a very high percentage of lambs on their mothers have certain salient features:—

Preponderance of the Southdown-Romney cross in which a good type Romney ewe is used.

Ability to winter the ewes well and thereby produce vigorous lambs of good birth weight.

A mild climate on a soil type favouring early and persistent pasture growth during spring and summer. Under these conditions lambing begins in July and August and it is necessary to carry a high proportion of beef cattle to control the spring pastures. The cattle thus act indirectly as lamb fatteners.

A high standard of pasture management associated with rotational grazing. The ewes and lambs customarily follow the cattle from paddock to paddock on to shorter growth which is richer in feeding value.

In districts less favoured by the climate, spectacular examples have occurred of the percentages of lambs sold fat off their mothers being raised from 15 to 40. That has been achieved by the use of more suitable breeds of sheep managed better on more suitable pastures. In the drier climates of the South Island the increase on many farms has been attained by the use of a proportion of a special-purpose pasture such as Italian ryegrass and short-rotation ryegrass for early-spring production, and of cocksfoot and Montgomery red clover for summer production. The Italian and short-rotation ryegrasses are capable of providing a bulk of feed in July, August, and September before the perennial ryegrass-white clover pastures are normally productive. The cocksfoot-Montgomery red clover pastures are good summer producers, which can provide splendid fattening feed in December and January when the ryegrass-dominant pastures have gone to seed and consequently are a much poorer source of nourishment.

Though farmers everywhere are anxious to fatten an ever-increasing percentage of lambs on their mothers, the position in New Zealand at present appears to be that a large percentage of lambs in many areas of the North Island and most areas of the South Island still must be fattened on special crops and pastures after being weaned.

Weaning Time

When crops of rape, kale, or lupins are to be used for fattening weaned lambs the time of weaning is determined

Photograph in heading by Sparrow Industrial Pictures Ltd.

to some extent by the state of readiness of the fattening crop or the specially-spelled pasture. Rape should have reached a suitable state of maturity and kale or lupins should have made a satisfactory bulk of growth in the prevailing circumstances.

Lambs are very restless for a few days after being weaned, and considerable trampling damage can be done to the crops if lambs are weaned directly on to them. Therefore it is advisable to allow the lambs a few days on the best spelled pasture available to let them settle down. In about mid-December a pasture which is rich in clovers, especially red clover, should be spelled. Such a pasture gives the lambs a chance to settle down after being weaned, and equally important is the chance to start thriving again before going on to the fattening crop. They should then be drenched against parasites with phenothiazine and placed on the fattening crop.

Drenching at Weaning Time

Because lambs at weaning age are very susceptible to internal parasites, especially the stomach worms, severe infestations may develop after weaning on crops or pastures if unexpected wet conditions eventuate. Therefore it is a wise precaution to drench weaned lambs, with phenothiazine for preference, and to do it immediately before the mob is shifted on to the fattening crop. Lambs to be fattened on pastures also should be drenched against parasites before going on to such pastures.

Bought store lambs to be fattened on crops should be dipped and placed for a few days on pasture aftermath or stubble to allow them to settle down. They should be drenched for parasites immediately before they go on to the fattening paddocks.

If the lambs are drenched about weaning time or after purchase as stores, no additional drenching should be required if reasonably-dry summer to autumn conditions follow. However, drenching late-fattening lambs usually is advisable about 3 weeks after the start of wetter autumn conditions, which are likely to favour the multiplication of pathogenic parasites.

Fattening on Rape

In the medium- to light-rainfall districts of New Zealand, many more lambs are fattened on rape than on any other crop. Rape grows well on a wide variety of soil types, and it can be conveniently followed by wheat or new grass in a rotation. As it must be mature before feeding is begun, rape does not show to best advantage in cold foothill areas or in heavy-rainfall districts, where it may fail to mature satisfactorily. There is some uncertainty with rape because of its susceptibility to insect pests and fungus diseases. Rape cannot be relied on in districts where grass-grub may devour the seedlings, where white butterfly and diamond-backed moth may ruin the foliage, or where club root disease may wreck the growing plants.

Matured rape provides a complete diet rich in digestible protein. Experiments have shown that a maximum speed of fattening can be attained on rape alone without any additional supplement in the form of hay or grass run-off.

As a result of the plant selection and certification of seed undertaken by the Department of Agriculture, two main types of rape are in common use at present, Broad Leaf Essex and Giant, Broad Leaf Essex being the more common. It grows to medium height, matures earlier and more readily, and provides a good second growth for flushing ewes later in the autumn. Giant rape is a later-maturing type which on heavy soils tends to grow too tall for the best results. It is a popular variety for the lighter lands and also to follow the first sowings of Broad Leaf Essex on better soils. It usually produces a greater initial bulk of feed of a little better feeding value, but it does not produce a second growth to compare with that of Broad Leaf Essex.

When lambs are placed on rape before it is mature they are very likely to scour, or they may suffer from rape scald, which can be recognised as an acute inflammation of the skin tissues of the head and often affecting the backs of shorn lambs. These dietetic troubles, and also the poor fattening qualities of young rape, are associated with an excessive protein content at the green stage of growth.

The stage of maturity at which feeding off can be started to best advantage is when the rape leaves have turned purple on their edges. This purple coloration coincides with a nutritive ratio of protein to carbohydrate in the leaves which is best for fattening. In an average season rape is usually mature 8 to 10 weeks after being sown. Though immature green rape should not be fed, disappointing results may be obtained from rape which is too mature and fibrous. For this reason rape can be used to greatest advantage when sown in breaks at fortnightly intervals. Rape is in its most suitable digestible form during the 4 weeks after it reaches maturity.

For the greatest benefit to the animals, rape should be fed in breaks of such a size that they can be eaten out in 10 days. Shifting the mob at 10-day intervals breaks the life cycle of the harmful internal parasites which become troublesome after unexpected moist weather. The lambs should not be allowed to run back over the old break after being put on a new break. Under average Canterbury conditions of rape growth, about 700 lambs would eat out a 10-acre break of rape in 10 days. It is also estimated that a good average crop of rape should fatten 25 lambs per acre in about 5 weeks on rape alone, though these numbers vary with the condition and age of the lambs when placed on the crop. During recent years the scarcity of wire netting has prevented much subdivision of rape paddocks, so the decision whether to feed in subdivisions depends on labour and wire netting in relation to past experience with rape wastage and parasitic disease of the lambs on the farm.

Experiments on rape fattening of lambs conducted at the Kirwee Experimental Farm (recorded in the "Journal" for November, 1946) indicated the following conclusions:—

> Vitamin or mineral lick additions are unnecessary provided there is no confirmed cobalt deficiency.
>
> Grain supplements or the provision of hay for lambs on rape do not hasten the speed of fattening and give no advantage over rape alone.

[*Green and Hahn Ltd. photo.*

Lambs being fattened on rape. Mature rape provides a complete diet rich in digestible proteins.

[*National Publicity Studios photo.*

With a favourable climate and a high standard of pasture management, a high percentage of lambs can be fattened on the mothers.

Lambs fatten fastest and best if fed on rape night and day with no run-off to pasture.

The answer to whether lambs on rape need drinking water cannot be generalised into "yes" or "no." An investigation at Lincoln College (Canterbury Agricultural College Bulletin 97) indicated that lambs on mature rape fattened well when given free access to artesian water. The water was taken only when it was required during hot, sunny weather. From the general experiences of farmers it appears that the provision of water is not necessary when rape is fed in breaks in average climates. If the lambs become restless on rape in hot, dry periods, lack of water may be the first factor requiring correction.

Feeding rape during wet spells of weather is not advisable. Lambs should be shifted off rape during continuous wet weather to avoid the setback of scouring disorders. During moister periods it has been found an advantage to supplement the rape with hay or chaff.

Rape Scald

Lambs occasionally may suffer from an acute inflammation of the skin tissues of the head, which may also occur on the backs, particularly of shorn lambs. The lesion is typical of a sunburn or photo-sensitisation, which in this case is activated by an assumed sensitising agent present in green rape. The facial tissues become swollen and painful, the ears appear very swollen and pendulous, and the skin of the back may be tender and inflamed. A yellow lymph fluid may ooze from the affected skin surface. Though there is no liver damage and jaundice, such as occur in facial eczema, the lambs suffer a setback in their rate of fattening. Affected lambs seldom die.

Experience dictates that rape scald occurs most commonly in lambs placed on green, immature rape. It may occur to a less extent in an apparently-mature crop under the humid conditions that stimulate a fresh growth of leaf. Most farmers are accustomed to a few cases of rape scald and may remove the lambs temporarily only if the trouble is severe and the crop fairly green.

To prevent scouring and rape scald it is wise to introduce lambs to mature rape during dry weather when the leaves are not covered with excessive moisture.

Second Growth of Rape

The recovery growth of rape that follows the first clean-up is generally considered much poorer in fattening quality than the first growth. That may be partly because the second growth is commonly fed when immature, and better results may be obtained if the recoveries are allowed to mature well.

Most farmers prefer to use second-growth rape for flushing the ewes before tupping. It is excellent for this purpose.

Rape and Grass

A double-purpose result from one seed-bed preparation is often achieved by sowing down rape with a pasture seed mixture of either short- or long-rotation type. The pastures usually establish themselves quite well, but it is evident that the mixture of feed is usually not as good as rape alone for the fastest fattening. In wetter seasons, or in more humid districts, the sole of grass and clover will favour the development of parasitism. For this reason it is advisable to feed a crop of this nature in small breaks of about a 10-day capacity in areas where parasites are troublesome.

Italian ryegrass sown down with rape in the dry areas will give a more reliable supply of fattening feed when the rape may fail from aphis or other insect attack.

Thousand-headed Kale

As a fodder crop for fattening weaned and store lambs, thousand-headed kale has certain advantages over rape that commend it for greater use by farmers in districts where rape is slow to mature or is uncertain in yield because of disease or pests.

Rape and kale were compared critically in a lamb-fattening test during three seasons at the Manutuke Research Station, Gisborne (recorded in the "Journal" for October, 1947). On the Gisborne flats thousand-headed kale proved superior to all other crops for general use. The daily live-weight gain of the lambs was as good on the kale as on rape, and the crop can be fed safely at any stage of growth. With kale the farmer need not worry about the problem of immaturity or over-maturity of the foliage, and in dry seasons the lambs can be weaned off the deteriorated pastures earlier if kale is available instead of immature rape.

It is apparent that kale is a more reliable crop than rape in dry districts. As a rule the crop recovers well after being fed off, and 4 lots of grazing may be obtained from January to July. In districts where rape grows well and matures well kale is considered to be a little slower as a fattener than rape. Crops of kale are grown frequently in the Wairarapa, Hawke's Bay, Gisborne, Southland, Mid-Canterbury, and North Otago districts.

The principles of feeding kale are much the same as with rape. No additional supplements are necessary, and in areas where parasitic diseases are troublesome it would be advisable to feed the crop in fresh breaks that could be eaten down in 10 days.

Sweet Blue Lupins

A crop which can also be available for lambs at weaning time, sweet blue lupins were grown to some extent in former years on the lighter lands of Canterbury, particularly in the Ashburton district. In this area they are not troubled seriously with the diseases collar rot and mosaic, which limit their usefulness in North Island districts. Not only do lupins fatten lambs, but they also fix nitrogen in the soil and thereby assist to build up the fertility of light lands.

Sweet blue lupins are usually ready to feed about 11 weeks after being sown, and the fattening value is good from just before flowering up to the seed pod stage. They may be sown with grass, rape, turnips, or oats. The rape or turnips are usually eaten first; by the time they are eaten down the lambs are settled into the lupins. A mixture of this nature guarantees a crop of fattening feed in seasons when rape or turnips are failures.

Lambs do not start to feed on lupins as readily as they do on kale or rape, and the useful feeding period of lupins is much shorter.

Chou Moellier

Generally regarded as an autumn fattening crop for stores and late lambs, chou moellier is commonly grown in the east coast districts of the North Island for fattening, though the crop can grow well in most districts.

Chou moellier can be grown on lighter lands as well as on heavy, moist soils. It is more resistant to club root and insect pests than either rape or turnips, and is also more reliable than rape in drought conditions. For these reasons the crop is popular as a substitute for rape for autumn fattening feed. The foliage can be fed safely at any stage of growth and does not become over-mature in the same way as rape.

Depending on the time of sowing and the district, chou moellier can be ready to feed in February. The lambs can be fed continuously on the same principles as with rape. It fattens at a significantly-slower rate than rape, and the provision of hay or chaff is recommended as a supplement.

Root Crops

The 3 classes of root crops commonly used for the autumn fattening of stores and later lambs are soft (white-fleshed) turnips, yellow-fleshed turnips, and swedes. The turnip varieties are much the same in their capacity to fatten lambs, which they do more slowly than rape, kale, or lupins. They are particularly suitable for use after rape or lupins have been fed off earlier in the season.

The type of turnip chosen will be determined largely by soil type and climate. Soft turnips grow more rapidly than swedes and are used successfully on the drier, lighter lands. Swedes grow to advantage where the rainfall and soil moisture are more abundant. Yellow-fleshed turnips are confined chiefly to the colder districts of Otago and Southland.

Early varieties of soft turnips may be ready for use in February and can remain in a suitable state for feeding over a longer period than rape. Store lambs should be dipped, then settled down on pasture before going on to turnips. and break feeding can be adopted as with rape and kale. In Canterbury, supplements of good hay or chaff are recommended to speed up the rate of fattening, though the trials at the Manutuke Research Station showed that the lambs fattened at a very satisfactory speed on turnips alone. In Canterbury and Otago, turnips are used frequently and satisfactorily as a mixed sowing with pasture.

Fungus and insect diseases are often severe on turnips, with the result that farmers in many districts prefer crops more resistant to these pests.

Lambs will fatten satisfactorily on swedes, especially if the top growth is good.

Stubbles and Aftermaths

After the completion of harvesting operations in grain-growing districts, an undergrowth of grasses, clovers, and weeds is usually available among the stubble. Where lambs are fattened on the same property, the weaned or store lambs are usually fed on these stubbles for what they are worth and depending on what alternative feeds are on hand at the time. Lambs will do very well on stubble as long as a succulent bite of undergrowth such as clovers and flat weeds is available. Where stubble can be fed it is a good practice to sow down some red clover seed with a spring-sown cereal and thereby enhance considerably the feed value of the stubble.

In the pasture seed-growing areas of New Zealand special pastures of perennial ryegrass-white clover, short-rotation ryegrass-white clover, or Italian ryegrass-red clover are sown down mainly with a view to seed production. These seed crops are usually harvested in January, and then the aftermath or bottom growth becomes available for stock feed. With ryegrass-white clover the aftermath may provide useful grazing for several days, extending from weaning time to the time when the rape is ripe and ready. The aftermaths of hay crops are used similarly.

As the pasture seed-growing and cereal areas of New Zealand are in regions of lower rainfall, the stubbles and aftermaths vary considerably with the amount of moisture in spring and summer. They are clean, parasite-free feeds for weaned lambs.

Special-purpose Pastures

In the drier areas of the South Island, particularly in Canterbury, the use of special-purpose pastures for the provision of autumn fattening feed is rapidly becoming popular. A seed mixture of Italian or short-rotation ryegrass and clovers is sown down in December or early January on fallowed land which ensures a maximum of establishment and production. This pasture will usually provide sufficient feed for fattening lambs in about 8 weeks from the date of sowing.

A young growth of pasture is at least the equal of any other feed for the rapid fattening of lambs, provided only that the weather is not so wet as to cause excessive scouring.

Second-grade Lambs

In order that fat lambs should grade well in the meat works, it is important that they should suffer no bad setbacks during fattening, but be kept forward and thriving whenever possible.

Over a whole season about 20 per cent. of the total lamb kill may grade as seconds, the number varying with the district and the type of season. It is known that 80 per cent. of these lambs are graded down to seconds because of lack of finish or condition, and the remainder are accounted for as bruised, yellow, or badly-dressed lambs. In the early part of the season, when milk lambs and early fats are killed, only 10 per cent. may be second grades, but as the season advances the percentage of seconds rises to a maximum in the late fattening drafts.

Too much stress cannot be laid on the importance of careful management and frequent critical inspections of the lamb flock to detect as early as possible any evidence of excessive scouring, unthriftiness caused by detrimental condition of the feed, or checks in condition and anaemia associated with the ravages of stomach worms.

In far too many cases flocks of lambs have suffered an unduly severe setback before an appropriate diagnosis and correction have been effected, which in turn has been reflected in higher percentages of second-grade lambs slaughtered off those properties

BOOK REVIEW

"The Production and Marketing of Pigs:" H. R. Davidson

THOUGH the author is writing primarily for English conditions and states that what is set down is "the interpretation of his own experience, the teaching of others, and the co-ordination of both," this is a book of outstanding significance and one which anyone interested in pig production should have.

A wealth of wisdom on husbandry matters, the result of study of production in many countries and of subjecting every phase to the searching criticism of his own practical experience, makes the book absorbing to the producer and a text book which any student of pig husbandry will value highly.

Management and particularly the importance of the personal factor in pig keeping are given the treatment that is possible only from one who has had years of practical experience and has the keenness of a student for his subject. Much of the sections on management, breeding, housing, and feeding can have direct application in any pig-producing country, and many items of interest in the pig industries of different countries are carefully covered. Mr. Davidson has had a long association with New Zealand pig meats in England, being a member of the committee of experts who developed the "Smithfield system" of judging carcasses, primarily to provide an accurate means of reporting to producers in this country on the quality of their porker and baconer carcasses. Particulars of the Smithfield system and also of the system now used in this country in the judging of carcass competitions are given.

The book is well illustrated and of more than passing interest to New Zealand producers are the chapters dealing with carcass quality, which emphasise what is required by the bacon curer and pork butcher in Britain. The author has succeeded admirably in giving a balanced treatment of his subject, and the book is a worthy member of an outstanding series.

—A.L.

Longmans, Green and Co. Ltd., 30s. net.

A Pergola can Lend Beauty to a Front Entrance

BOTH Italy and Spain, where the pergola originated, have the warmth of climate and colourful settings necessary to make garden architecture easy and effective. There the pergola is constructed as a shaded walk connecting two features in a garden and allows the desirable length of view when the features are approached. In few New Zealand gardens are these conditions available; but a pergola may be erected over a driveway from gate to house with pleasing results. This article by F. M. Hill, Horticultural Inspector, Department of Agriculture, Christchurch, offers advice on the construction of pergolas and the selection of climbing plants to be grown on them.

[Green and Hahn Ltd. photo.

The desirable length of view seen from a well-placed pergola, constructed from round concrete pillars which are well clothed with roses and vines.

PERGOLA construction offers a choice of many materials, ranging from wood to substantial concrete or stone and wood structures. Whatever material is chosen, care should be taken that it harmonises with other garden features and is strong enough to maintain the weight of foliage with which it will be clothed.

Graceful concrete pillars are pleasing to the eye and will last almost indefinitely. Stone and wood provide good contrasts, and such pillars should be of rugged construction. Plain wooden uprights can be used for informal garden pergolas which are not so heavily constructed and, having no special beauty, are merely supports for climbing plants.

Dimensions

The height of a pergola should be at least 1ft. more than the width and the whole structure must be built in proportion. If the columns are to be round, their diameter should be multiplied eight or nine times to determine their height, the lintels which run parallel to the path should be 3in. by 10in., and the cross-pieces or rafters should be 3in. by 8in. projecting at least 24in. and boldly cut to a good outline.

Stone columns should be at least 24in. square and the wooden superstructure at least 9in. by 9in.

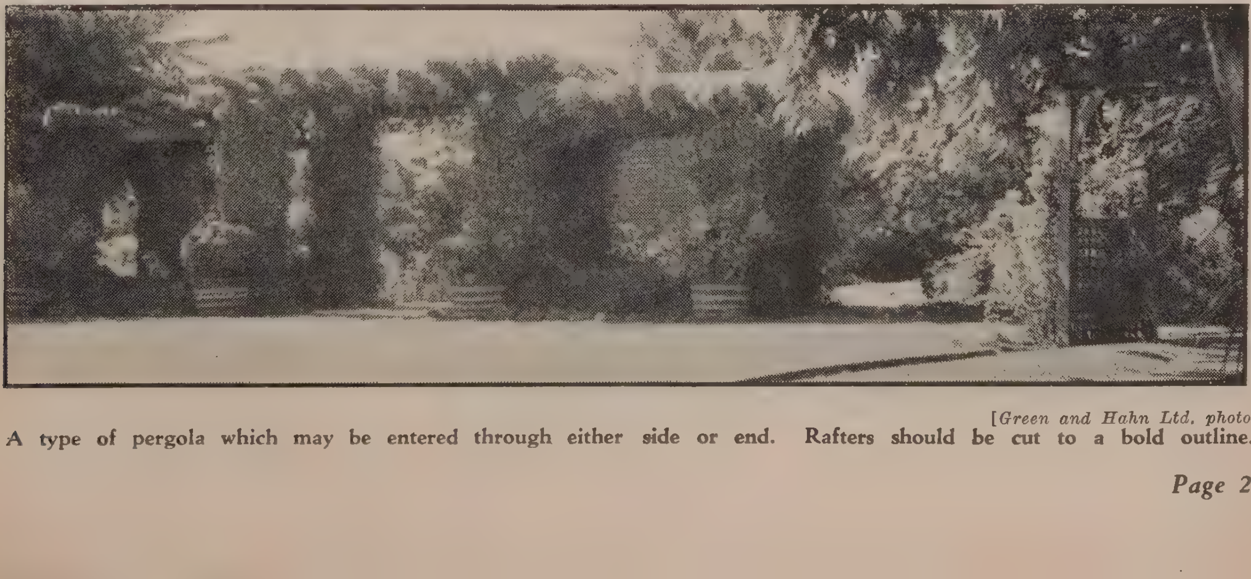
Details of construction of a simple garden pergola are given in the diagrams on the next page. The framework should be of 3in. x 2in. timber and the small filling frames 1in. by 1in. Hardwood or concrete butts should be sunk at least 24in. in the ground and the uprights bolted to them. Pieces of 2in. x 1in. at right angles to and on top of the rafters give better support for climbing plants. The timber used should be either oregon or red pine to withstand the weather.

White or cream are the colours usually chosen for painting, but they may look cold and glaring during the winter. Shades of green are good, but do not show much contrast with the plants, and the best effect will be obtained with shades of brown or oak.

Paving

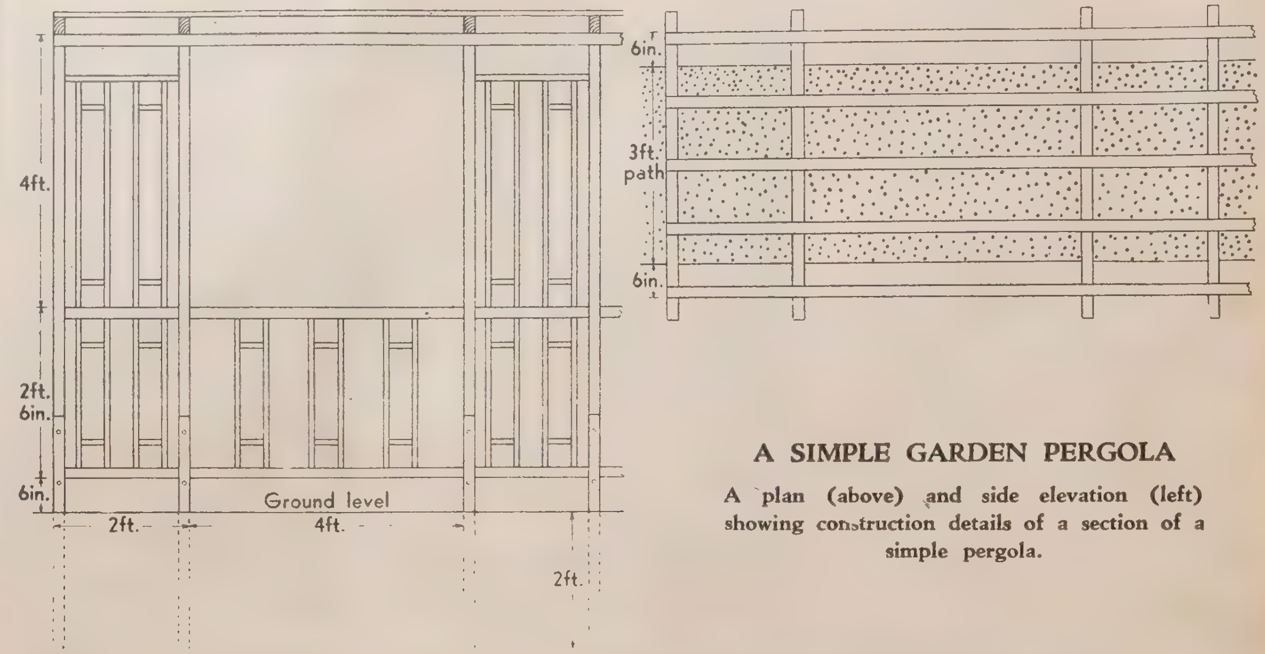
Some effort should be made to provide a contrast between the floor of the pergola and the remainder of the path. Turf is not usually satisfactory because the shade affects the growth of the grass.

Floors should be built to last, and it is recommended that 9 to 12in. of either clean cinders or crushed stone be thoroughly tamped down followed by a 1in. cushion of sand, on which may be laid brick, slate, stone, or concrete. To prevent surface water from collecting, all paving should have a



[Green and Hahn Ltd. photo.

A type of pergola which may be entered through either side or end. Rafters should be cut to a bold outline.



A SIMPLE GARDEN PERGOLA

A plan (above) and side elevation (left) showing construction details of a section of a simple pergola.

pitch of ¼in. to each foot of width. Cement should be used between the joints of brick or stone to prevent grass and weeds growing through.

Climbing Plants

The range of climbing plants suitable for training on pergolas in New Zealand is wide, and choice must depend on several factors—for example, whether complete coverage of the structure is desired or only the clothing of the pillars; whether flowers or foliage are to be the ornamental feature, what variations of weather the plants may be called on to withstand (many varieties are frost tender); and at what season the pergola is to be looking at its best. Frequently disappointment has resulted from the planting of types unsuited to the conditions or the effect desired, and to avoid that a reliable nurserymen's catalogue should be consulted.

However, following is some general advice about the more popular and commonly-used plants:—

Roses

Climbing roses will flourish in the open where ample climbing room is available. A large hole should be prepared and the subsoil well broken with a fork. If the soil is inclined to be light, a barrowload of topsoil from a pasture paddock may be added. With this should be incorporated a little farmyard manure, but do not manure too heavily for the first year or so until the roots become properly established. Plant the rose firmly in autumn and tie the shoots to a stake for support until pruning in spring, when long rods should be cut back to two-thirds of their length and weak shoots may be either cut back hard or removed. In succeeding years little pruning should be necessary except to cut out weak or surplus growths. When flowering is completed all stems which have borne flowers should be removed to allow new growth to develop for the following year. Every four or five years the whole plant may be untied and let drop to the ground, where all old or weak growth can be removed and the plant thoroughly thinned out to two or three healthy rods from the main stem, which should then be retied to the structure.

[*Green and Hahn Ltd. photo.*

A simple garden pergola carrying a great wealth of roses and wistaria.

Some popular varieties of climbing rose are Etiolle de Holland (scarlet), Shot Silk (pink), Mrs. C. A. van Rossen (flame), and President Hoover (apricot).

Clematis

In nature clematis flowers bloom in full sunlight while the lower part of the plant is always shaded; therefore it is wise to establish the plant on the south or shady side of the support. The soil should be of open character, containing lime and a liberal quantity of leaf mould, and should be deeply trenched.

Clematis indivisa, the New Zealand type, often found in the bush, is a hardy evergreen which carries a wealth of white, starry blossoms. The only pruning necessary is to remove dead or useless wood, giving light to the stems retained.

Clematis jackmanii is a deciduous type, and as the season's growth dies off in autumn, it should be cut down to within a foot of the ground in May. As the shoots begin climbing again in spring they should be securely tied to the support. Some varieties are Comptesse de Bouchard (carmine rose), Gypsy Queen (velvety purple), *Jackmanii superba* (dark velvet), and Perle d'Azure (bright blue).

Wistaria

A great favourite, wistaria will grow rapidly after two years if established under good conditions. The main requirement is a deep, well-drained loam of a moist, sandy nature.

Both winter and summer pruning are necessary to promote healthy flower buds. Strong laterals should be encouraged to grow to a length of 3 to 4ft. from the main stems, but weak growth should be removed. When the framework of the plant has been built in this way the young growths should be cut back to within an inch or two of the main stem every winter.

Wistaria sinensis, a rapid climber, bears a great wealth of lilac-coloured flowers. It is advisable to buy grafted plants, as they will flower earlier than those produced by layering.

Wistaria floribunda has white flowers. It is hardier than *W. sinensis* and therefore more suitable for colder climates.

Honeysuckle (*Lonicera*)

Honeysuckle will thrive in any good, dry soil containing well-rotted manure. Pruning consists mainly of trimming straggling shoots after flowering has finished.

Lonicera halliana, an evergreen flowering climber bearing fragrant white to yellow flowers, is a hardy variety which will grow in shade.

Lonicera heckrotti is a deciduous variety which prefers a shady position. Its flowers are orange to yellow with shades of crimson. This variety must be watched closely, as it is liable to aphis infection.

[*Green and Hahn Ltd. photo.*

An attractive garden feature using stone and wood in heavy construction.

Virginia Creeper (*Vitis*)

Though their flowers are of little value, Virginia creepers are remarkable for the varied colours of the foliage in autumn. They are hardy climbers and thrive excellently in well-prepared soil containing lime. They are best planted on the sunny side of the support and given an unrestricted root run.

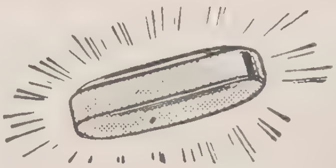
These vines require very little pruning until they begin to show bare round the base, when the older stems should be dispensed with and younger growths trained in their places.

Vitis acontifolia is a vigorous, graceful, deciduous climber which appreciates abundant food and moisture during the growing season.

Vitis quinquefolia, the true Virginia creeper, has foliage which is most beautifully coloured in autumn. It also is deciduous and requires plenty of food and moisture during the growing season.

[*Green and Hahn Ltd. photo.*

A formal pergola well constructed with tapering concrete pillars to make an interesting driveway.



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Household Poultry: "Backyarders" and "Sideliners"—Breeding Stock—Culling Hens Before the Moult

THOUGH the household poultry keeper may not intend to run a breeding pen, but proposes always to buy day-old chicks or perching pullets, for at least two reasons he should understand something about the practical side of breeding: First, stock should not be bought from any hatchery without a prior inspection of its breeders and management, and, second, all the standards for selection of breeders are consistent with those for good laying potentiality. To retain good hens and make the best profits from them, the ability to recognise "laying" type is necessary. Therefore, though this series of articles by W. L. McIver, Poultry Instructor, Department of Agriculture, Dunedin, is intended primarily for the backyard and sideline poultry keeper, some reference to breeding stock is by no means out of place.

High-grade progeny can be expected only from breeding birds selected to a high standard. Even then, culling must be done regularly from the day-old stage.

ONLY the person interested in poultry shows should treat hens as a hobby. The housewife running half-a-dozen fowls for egg production for the family should never look on herself as doing so for a hobby. Fowls should never be kept, but should keep themselves and pay a profit in addition. Poultry feed, even when helped out by household scraps is not cheap. Valuable food and accommodation should be reserved for the better layers, and poorly-producing birds should be set aside for the table. Feeding a non-layer now costs about 3d. a week, and the owner should think twice before feeding 3s. worth of food to such a bird pending her resumption of laying. Quite likely, before she has given that value back in eggs she will go off the lay a second time.

Above all, hens should not be kept year after year simply because the owner does not like or know how to kill them and therefore lets them die natural deaths. Poultry must be required to do their work properly and to give a return for the labour of managing them.

"Backyarders" and "Sideliners"

The expression "backyarder" will occur frequently in these articles. That term might be regarded by some as indicating a derogatory meaning, but there is no better expression to apply to the husband or housewife who keeps a few hens "down the garden" to provide fresh eggs for the family.

A "sideliner" is a person who runs more fowls than the 3 to 24 of the average backyarder and requires his fowls to show a financial return for the outlay and work and so supplement the family income. Though they have been referred to as "his fowls," and though the husband takes the major responsibility and does the heavier work during the weekends, almost always the wife's efforts make the venture a success. A backyarder who is thinking of expanding his flock to between 100 and 400 layers should first make sure that his wife likes birds, is prepared to spend a great deal of time mothering the chicks and growing pullets and hours of patient work in fussing around the hens, and, in general, approves the venture. If so, there is no reason why he should not do well as a sideliner.

All that is needed in addition is a proper application of common sense; sufficient capital to start on right lines from the beginning with first-class housing; enough land for the number of birds it is intended to run; good-quality stock; and, above all, a willingness to accept useful advice from knowledgeable sources. However, he should make certain that the sources of information are dependable.

Breeding Stock

That the strain is more important than the breed is now well recognised, and to ensure good hatchability, rearability, and egg production very careful attention must be given to the breeding stock. The strong tendency to select the required number of breeders computed to supply sufficient eggs to fill the incubator must be guarded against. If an individual bird does not measure up to the minimum standard—and that minimum must not be low—she should be rejected as a breeder.

Many hatcherymen contend that pullets make satisfactory breeders because, being young and vigorous, they are likely to produce eggs which will induce greater stamina in the chickens. That theory may be correct as far as it goes, but pullets lay smaller eggs; their eggs are saved for hatching only after they have already been several months in production and, perhaps, lowered their vitality; there has not been the same opportunity as with hens to cull them for lack of quality, resistance to disease, and other standards; and, above all, they have not had sufficient opportunity to show that they have viability. A better way to obtain high-grade chicks is to place more value on the hen that retains vigour and vitality, notwithstanding her age. At least, she has proved her longevity and laying capability.

It is possible for the owner of a small unit to recognise most of his hens, and characteristics he has observed among his birds can then be taken into account when judging them as potential breeders. There is a great deal in favour of the belief that good

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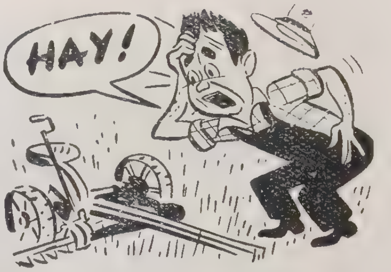

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producers leave the perch early in the morning and are the last to return to it in the evening. The hen with worn toenails that is constantly scratching and on the look-out for food usually is a good layer.

As favourable characteristcs are observed among pullets and hens, the fowls should be marked with legbands of different colours to signify their abilities—for example, a red ring on a pullet that came into production earlier than the average; green for one that laid longer than the average and moulted late; yellow for a pullet that went through a winter neck-moult. From observations of the individual habits of the birds, and a knowledge of the reasons why various characteristics are significant in the selection of birds for production, the value of a hen as a breeder can be judged readily.

In general, it can be accepted as true that the pullet that begins to lay late will stop early, and one that starts to lay early in life will carry on late. Therefore, late moulting is a sign of a good layer.

The condition of the comb tells what is going on in the ovary. It indicates the hen's reproductive state and enables the poultry keeper to judge whether she is about to come into or go out of the lay. If the comb is dry, hard, and scaly, she may still be laying but will soon stop. When a bird is laying heavily the vent and the abdomen are much larger than at other times.

The long, narrow head, sunken eye, undeveloped comb, shallow body, and loose feathering betray this bird as a poor layer which should not be kept for another year. Feeding such birds through the moult does not pay.

Here are some points to observe in choosing breeders: Look for hens with a good length of back width across the hips, and depth from the back to the adbomen. The weight can be a useful guide, but it must be used more for judging the body or frame size; heavy weight caused by a bird's carrying excess body fat is unfavourable. Feel the condition of the abdomen and discard hens which are too fat. Examine the birds to see that the comb shape, eye colour, and feather colour are correct for the breed. Look for defects such as side sprigs on the comb, feathers on the shanks and between the toes of clean-legged varieties, wry tail, and crooked keelbone. Handle the birds frequently and learn to recognise them as individuals.

So far only females have been discussed, but the importance of the male bird in the breeding pen must not be overlooked. Because it is usual to mate 1 cockerel to every 10 or 12 females, the male should be examined for type and faults in that ratio of importance. A minor breeding fault which might be overlooked in a hen should not be tolerated in the male. The aim should be perfection, and the standard should not depend on the hope that a weakness in either side of the mating will be made up by the merits of the other sex.

Owners of small backyard units tend to excuse the mating up of all the pullets and hens in the pen, without attempting any culling, by advancing the fact that there is only one poultry house and the breeders cannot be separated from the others. In such circumstances the poultry keeper should not attempt breeding but should buy day-old chicks.

The buyer of chickens should satisfy himself that the seller's flock is up to the standard he desires. Feeding the good producer costs very little extra, and she returns value for upkeep.

Breeding for Improvement

In livestock breeding there is no such thing as standing still; either progress is being made or the breed is slipping back. As is the case with many truisms, the saying that "like begets like" is correct only in a limited sense. Nature tends to reproduce progeny inferior to the parents, the best living on while the weaklings die. A far more accurate truism relating to breeding is: "Always allow a little for Nature."

Through a far better understanding of feeding and rearing chickens and of disease control, each year thousands of pullets are now reared to maturity which in the past would have died. Consequently the need for adequate culling and careful selection of breeders is greater. The observant hatcheryman will notice greatly superior results from a smaller pen of breeders selected to a high standard than from a larger pen of inferior birds. This superiority extends to production of suitable hatching eggs, fertility, hatchability, and rearability, as well as to a better average-grade progeny, involving fewer pullets being culled out.

Breeding from superior-quality hens pays the best dividends in the long run. Even if this principle restricts the size of the breeding pen and the rate of flock expansion, it lays the foundation on strong, sound lines; expansion of the flock later is easy.

For several years the poultry industry has been operating a New Zealand Poultry Flock Improvement Plan, administered by the Department of Agriculture. The general aims of this plan are an improvement of flock standards, increased egg production, reduction of disease incidence, and greater health, stamina, and vitality. Anyone who wants to learn more about this scheme should consult the local Poultry Instructor.

Culling Before the Moult

Selection of the good layer or breeder goes hand in hand with culling out of the poor producer—in fact, the expression "culling" should be used to cover both activities, but popular usage now confines its meaning to withdrawing the inferior stock.

Modern culling methods are based on the principle that certain physical characteristics are correlated with production. These characteristics are divided into two general classes—those that indicate previous production and those that show present activity. The basis of culling is the assumption that if a bird is once a good layer, she will continue to be good, provided that a breakdown in health does not occur. The factors which indicate previous production are loss of pigment, time of moult, and its duration.

[*Green and Hahn Ltd. photo.*

The male is an important factor in the breeding pen and should measure up to a high standard.

Pigmentation loss is a direct result of egg production. In general, signs of deeper pigmentation in a bird than in the majority in the pen are unfavourable. Handle the suspected bird and feel the pelvic bones on each side of the vent. The thickness and pliability of these bones indicate the volume of recent laying. Hard, unpliable pelvics, closely spaced, with thick, fatty deposits, indicate the non-producer.

Now is the time of the year for the major and thorough seasonal cull, based largely on the moult. The best laying hens moult late; the early moulter is usually a drone. Cull out all the birds that have dropped their feathers already, and retain those that do not moult until April or even May.

Naturally, common sense must be used. If through some out-of-the-ordinary happening nearly all of the birds moult in February or early March, allowance must be made for the special factor and the moult cannot be used as the main guide.

If a thorough culling will reduce the number of birds too greatly, good-quality pullets should be bought even at this late stage rather than inferior hens retained.

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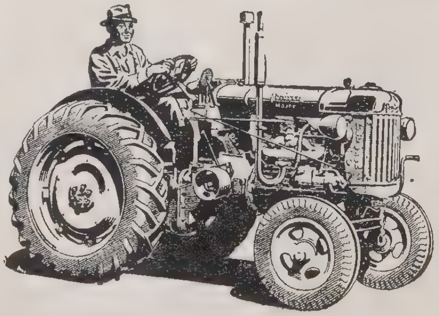

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SAVING AUTUMN GRASS FOR WINTER

SEASONAL NOTES Contributed by the EXTENSION DIVISION

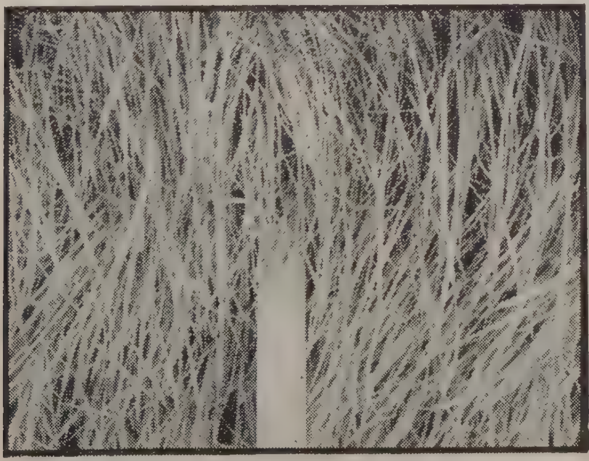
DURING the past decade the saving of autumn-grown grass for winter and early spring feeding to dairy cows has become established as a farm practice in New Zealand. This saved grass appears to be called "foggage" in Britain, a term which, rightly or wrongly, conveys the impression of unattractive, clover-deficient, rank herbage, mainly Yorkshire fog. Saved autumn grass of this kind is sometimes seen in New Zealand, and "foggage" is not a bad name for it, but it is not the desirable type of herbage for winter and spring feeding to early-calving cows, and usually is a result of unsuitable pasture management.

Early topdressing with phosphates is necessary before fields are closed for winter grass.

A LITTLE more than 10 years ago some fundamental research work on pasture management was done by the Fields Division (now the Extension Division) at Ruakura, part of it on a small dairy farm made out of a large field which contained much Yorkshire fog, cocksfoot, and perennial ryegrass as well as some white clover. Lenient grazing, particularly in autumn and winter, encouraged and strengthened these winter-growing grasses on this experimental farmlet, and that has also been the experience of many farmers. Admittedly, much butterfat has been produced from Yorkshire fog, and when it is young and vigorous it is a useful species in many pastures and to be preferred to others such as sweet vernal and goosegrass, but when fog is encouraged and strengthened it usually forms a matted undergrowth which is very bad for pasture production and of little value for milk production. Foggy pastures should therefore be avoided when the fields from which to save autumn-grown grass for the winter are being selected, and these pastures should rather be grazed hard to suppress the fog and clean up the matted growth.

Suitable Swards

The most suitable type of sward on which to save grass for winter feeding is a ryegrass-white clover pasture with little or no fog. Too much cocksfoot in the winter-grass pasture is not bad, for cocksfoot grows quite well in winter, though it may be "burnt" by severe frosts. In the warmer districts prairie grass is a valuable species to have in the winter-grass pasture; it produces a large amount of feed during late autumn, winter, and early spring. Where grazing is lenient dairying pastures may contain a considerable amount of prairie grass, particularly where the farmer realises the value of this species in his swards, sows prairie grass when laying them down, and subsequently manages his pastures to keep prairie grass in. Contrary to popular opinion, this can be done under the right conditions without difficulty. One farmer in the Bay of Plenty has a useful amount of prairie grass in every pasture, though he sows only 3lb. to the acre, discing it in at the final working down before sowing a normal pasture mixture. As a special-purpose crop on good soils (where there is an abundant supply of nitrogen) prairie grass, properly managed, is ideal for winter grass. Proper management of a prairie grass pasture includes lenient grazing (from about 12in. to about 3in.) and occasional haying.



Winter grass of the desirable kind, mainly ryegrass.

For several reasons plenty of white clover is essential in a pasture to be used for winter grass: First, unless the pasture contains plenty of white clover, the supply of nitrogen in the soil probably is inadequate and the grasses will not be able to produce much leafage; secondly, long spells between lenient grazings in winter and early spring will weaken what clover there is, and therefore it is desirable to have more than enough to begin with.

A field selected for winter grass should be well drained and well sheltered so that the soil will remain as warm as possible. Meadow soils or soils which are badly drained, low-lying, and subject to flooding should be avoided.

Early topdressing with phosphates, and with lime and potash where they are used, is necessary before the selected pastures are closed to stock in late autumn. This topdressing should be done preferably in late February or early March, and not later than late March or early April. Topdressing with nitrogenous fertilisers is not usual but will produce winter grass when used properly on the right kind of pasture. Whether buying such fertilisers for this purpose will pay is not definite, but it is mainly a shortage of nitrogen which prevents much growth of ryegrass in the winter.

Supplementary Feeding

Autumn grass can be saved for winter use and winter grass can be grown only when the pastures have been grazed leniently during autumn and are shut up after the last grazing in late autumn with several inches of leafage still ungrazed. That can be done only when the feeding out of hay and other supplements has been started earlier than seems to be necessary.

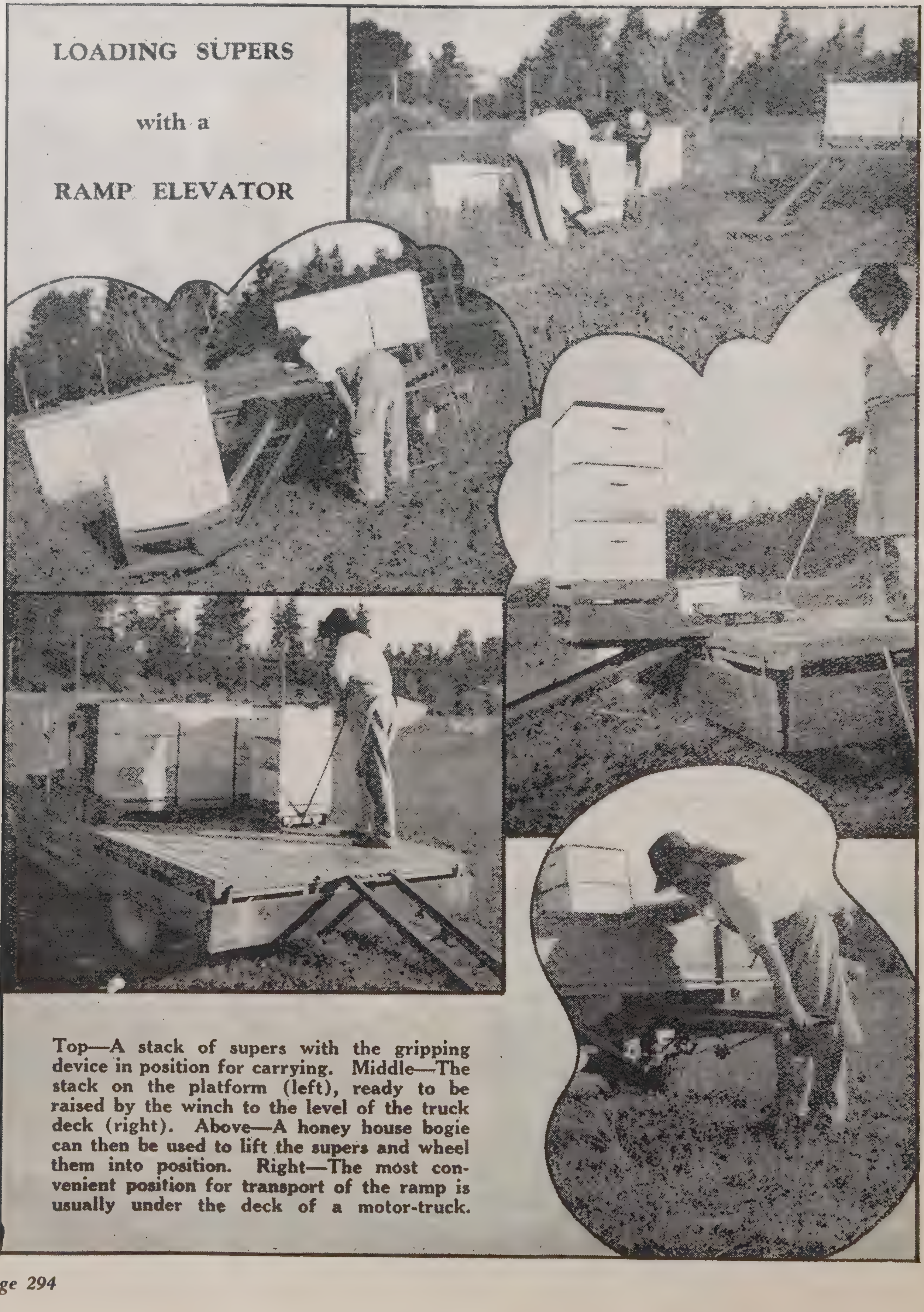
Feeding out normally begins when the pastures have been grazed bare, but that is far too late. It is like giving a patient a blood transfusion after he has been allowed to bleed to death. For winter grass to be grown, feeding out must begin some weeks before it becomes necessary. Only in this way can fields be closed while the grass is still growing, and only by closing fields while the grass is still growing can winter grass be grown.

◆

LOADING SUPERS

with a

RAMP ELEVATOR



Top—A stack of supers with the gripping device in position for carrying. Middle—The stack on the platform (left), ready to be raised by the winch to the level of the truck deck (right). Above—A honey house bogie can then be used to lift the supers and wheel them into position. Right—The most convenient position for transport of the ramp is usually under the deck of a motor-truck.

Ramp Loading Elevator for Apiary Work

IN apiaries which are essentially 1-man units and where active labour is not available continuously, the manual work of loading and unloading hives and other heavy equipment has always called for relief. Many mechanical aids have been devised and are in use with varying degrees of success. The latest contribution to the long list of such inventions is a ramp loading elevator devised by Mr. E. B. Diehl, of Waiau, North Canterbury, and described in this article by E. Smellie, Apiary Instructor, Department of Agriculture, Christchurch.

THE appliance can be used both in out-apiaries and in honey-extracting and packing rooms, loads of up to 5cwt. being handled with ease. The most convenient position on a motor-truck for its transport is usually under the deck between the main chassis bearers.

The apparatus is part of a system designed to eliminate heavy lifting in the gathering of honey crops, shifting of bees, or loading of packed honey on to trucks. Other appliances used in conjunction with the ramp are a honey house bogie (described in the May, 1945, issue of the "Journal"), a number of wooden stands for use with the bogie, and a gripping device for carrying stacked supers.

Using the Elevator

When honey is to be taken off, either by using escapes or by shaking, a stand with a drip tray on it is placed on the ground in a convenient position. As the honey is removed from the hives, up to 4 supers are placed on the stand and covered with an escape board or a bee-tight lid. This pile is then left and a second is made on another stand, the process being repeated until all hives have been dealt with.

The platform of the ramp elevator is lowered to the lowest position and a stand with its load of stacked supers is picked up with the lifter, carried to the ramp, and placed on the platform. When assistance is not availible for carrying these stacks, each stack can be assembled directly on the platform.

The winch is operated to raise the loaded platform to deck level. A friction brake holds the platform in this position while the stand and its load are lifted by the bogie and wheeled into position on the truck deck. When all the supers have been loaded a tarpaulin should be used to cover and fasten the load securely.

Unloading is a reversal of the process. When the truck can be backed into a dock where the deck is level with the floor, the bogie alone can be used to transfer the load to the honey house or warming room.

If it is desired to warm the honey before extracting it, some means of ventilation at the bottom of each stack of supers is advisable. This can be provided by cutting large windows in the sides and ends of a half super or similar frame, screening them, and placing this box on the drip tray before assembling the stacks at the apiary.

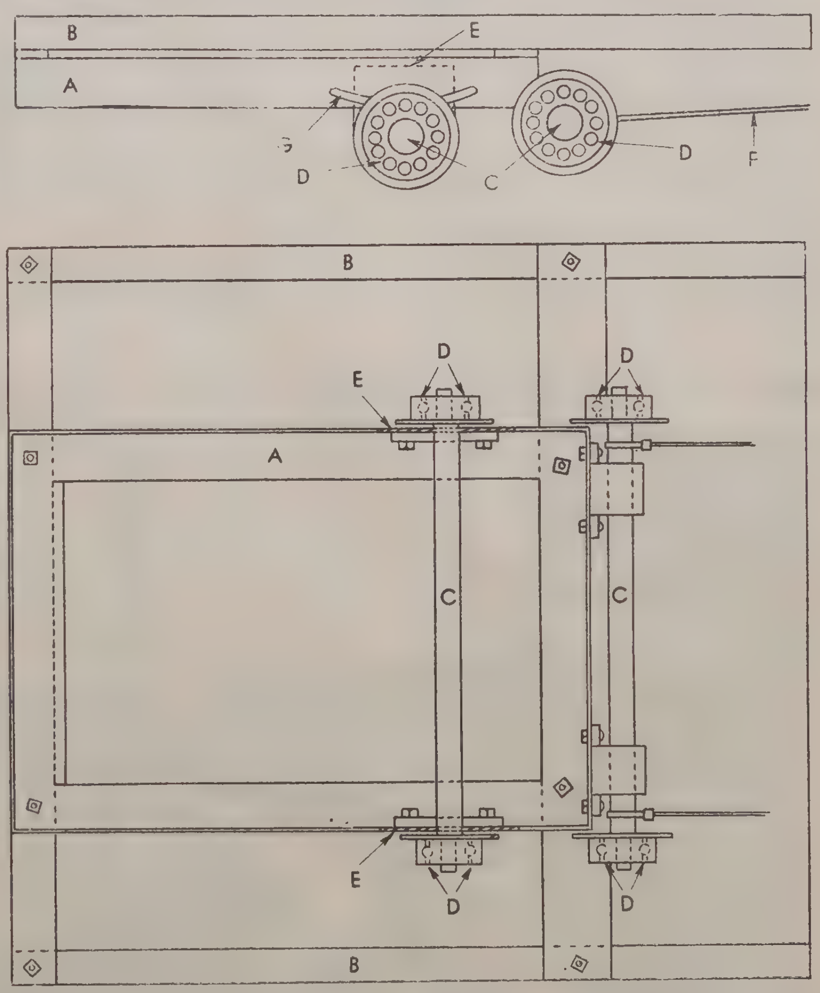
By having all bottom boards built on to runners which will allow the bogie to be used, it is possible to shift hives of bees quite easily when working alone. If any standard method of fastening the supers and bottom boards together is adopted, the ramp elevator and bogie act in the same way as for honey supers.

Cased cartons or tins of honey stacked on the platform stands can be readily moved about the store or on the truck deck by using the bogie. If the ramp elevator is used to raise these from the floor to truck level, the work of out-loading is expedited greatly.

Construction of Ramp

Two chassis irons from a Model T Ford or other similar channelling form the rails of the ramp. They are spaced with 2 pieces of ⅝in. water pipe (A), through which ½in. bolts pass from side to side (see diagram on next page).

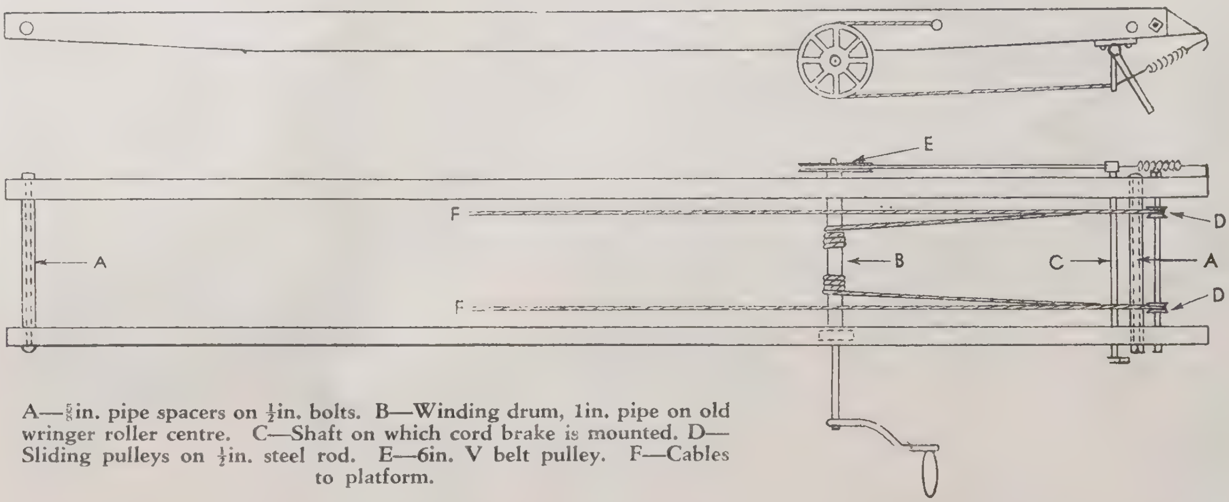
The winding gear (B) is mounted beneath the chassis irons and consists of a shaft and detachable handle.



Elevation and underneath view of the platform. A—½in. angle iron frame. B—Angle iron supporting wooden deck. C—¾in. shafting. D—2in. ball races with ⅝in. centres. E—Metal plates on which rear axle is mounted. F—Cables. G—Adjusting slots for rear axle.

RAMP LOADING ELEVATOR FOR APIARY WORK

ELEVATION AND PLAN OF RAMP



A—$\frac{5}{8}$in. pipe spacers on $\frac{1}{2}$in. bolts. B—Winding drum, 1in. pipe on old wringer roller centre. C—Shaft on which cord brake is mounted. D—Sliding pulleys on $\frac{1}{2}$in. steel rod. E—6in. V belt pulley. F—Cables to platform.

(An old wringer roller with the rubber removed and replaced with 1in. water pipe is ideal.)

The friction brake has a V belt pulley (E) mounted on a projecting end of the winding shaft. A piece of sash cord with one end secured firmly to a stud is carried round the pulley and fastened with a tension spring to the end of the chassis. A small brake lever, mounted on a shaft (C), is used to extend the spring and slacken the cord sufficiently to allow the winch to unwind and lower a load.

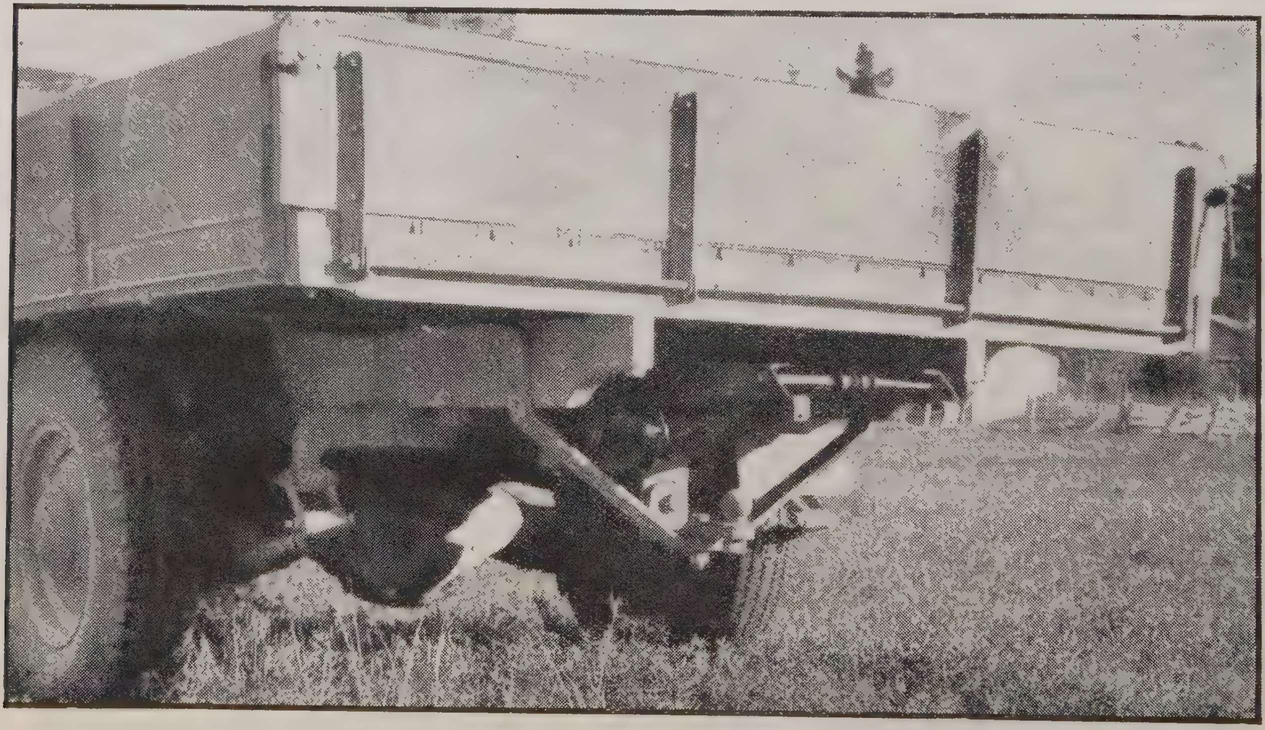
Two pulleys (D), mounted on a $\frac{1}{2}$in. steel bar, slide to allow correct alignment of the lifting cables (F).

The Platform

An angle iron frame (A) supports the platform (B), and 4 ball races (D) on $\frac{3}{4}$in. shafting (C) are used as wheels (see diagram on preceding page). These wheels run 2 above and 2 below the top flange of the ramp chassis. The rear shaft is made adjustable so that the platform may be kept level. The large flanges on the insides of the ball races prevent the wheels from slipping out of line during lifting.

The front axle is fixed, and the rear one is mounted on metal plates which can be moved in curved slots in the chassis (G) to allow adjustment of the wheels.

Light steel cables (F) are used for raising and lowering the platform.



For transport the ramp fits neatly under the deck of the truck between the main chassis bearers.

NATIONAL PIG HUSBANDRY SURVEY

By A. LONGWILL,
Superintendent of the Pig Industry,
Department of Agriculture,
Wellington.

PROFITS from pigs are generally closely associated in practice with a high number of pigs sold per breeding sow in a year. Of farmers who breed their own requirements those who sell 14 pigs per sow usually make better profits than those who are able to sell only 9 or 10 per sow. That many farmers are not able to reach even the lower figure is shown by the fact that only rarely has the Dominion average been more than 10 pigs per sow sold fat in a year. To determine if possible the chief underlying causes of the low average figure of pigs sold per breeding sow a survey is being undertaken by the National Pig Industry Council. Data will be collected from about 1000 farms over a 12-months period. All pig producers should be interested in this survey, which is designed to collect information which can form a guide to sound pig husbandry and greater profits from pigs.

AN examination of the slaughtering figures for pigs for the whole of New Zealand reveals the fact that the number of pigs slaughtered is not as high as it should be in relation to the number of breeding sows carried. Farmers who are able at present to market 14 fat pigs per sow or more are rare exceptions instead of being what they should be—typical representatives of a reasonably efficient industry.

Other countries prominent in world pig meat trade can consistently equal or better this figure. As their industry is based largely on grain feeding, the difference in feeding systems, particularly in respect of sows, may be the main reason for the difference in results. To ascertain why New Zealand results do not compare well with those overseas it is necessary first to analyse the statistics of slaughterings over the last decade, which are set out in Table 1. Though the number of sows has fallen to less than two-thirds of the peak number in 1936, there has not been any increase in the number of fat pigs sold per sow. In fact, the tendency appears to be the reverse, because, as shown in Table 1, the average for the first 5 years of the period is 9.8 pigs slaughtered per sow, compared with 9.3 for the latter half.

TABLE 1—PIGS SLAUGHTERED PER BREEDING SOW 1936-47 INCLUSIVE

Year	No. of breeding sows on farms as at Jan. 31	Pig slaughterings for 12 months ending Sept. 30	Pigs slaughtered per sow
1936 ..	116,058	1,038,236	8.9
1938 ..	104,803	1,090,524	10.4
1940 ..	92,029	873,304	9.4
1941 ..	99,648	1,006,686	10.0
1942 ..	90,608	925,982	10.1
1943 ..	82,023	772,744	9.4
1944 ..	77,281	740,913	9.6
1945 ..	77,202	681,280	8.8
1946 ..	72,573	664,275	9.2
1947 ..	67,938	645,728	9.5
1948 ..	68,354	650,466	9.5

Because of the change-over from mainly porker to mainly baconer production the weight of pig meat produced per sow has increased in the period covered by Table 1 from 8.1cwt. to 11.6cwt. An increase in the number of pigs fattened per sow might have been anticipated because of more stringent sow selection and the better feeding which should have been available for the smaller number of breeding sows, but possibly through deterioration of accommodation for farrowing sows and the falling off in interest in pigs generally the results have not been good and show little sign of improvement.

Most people, farmers included, think in terms of two litters per year from each sow and perhaps 7 or 8 pigs reared on an average, but there are many reasons why an average of 14 or 15 pigs per sow do not reach the hooks. The odd sow that fails to get in pig or loses the whole litter at farrowing, losses of numerous pigs at, or soon after, farrowing, and losses from disease or accident on the farm all account for the reduction of the average number fattened.

The purpose of the survey being conducted by the National Pig Industry Council is to find the relative importance of the various causes of losses. The collection of data will be made by supervisors of district pig councils and will cover a 12-months period on each farm. At the end of this period the records will be forwarded to the Superintendent of the Pig Industry, Department of Agriculture, for analysis, and the analysis will be submitted to the Technical Advisory Committee of the national council, who will report on it to the council. Individual returns will not be identifiable in any way with any particular farmer.

Before beginning such a survey it is wise to examine existing information to see what help it can give or what flaws it reveals so that the lessons from it can be applied to the survey to give reliable results which represent the true position in the industry as a whole. The small amount of information available is from the work of the old pig recording clubs and the Department of Agriculture's official litter records and pig census, all of which deal with a select, rather than an average group of farms, though the figures are worth studying. They appear to indicate that lack of prolificacy of the sows is not the prime cause of the poor results. The average number of piglets born for the 2313 litters for which figures are available is 9.4. The average number weaned is 7.3, giving an overall loss to weaning of 21.9 per cent. of pigs born. There is some indication, however, from the pig census data that a proportion of sows, particularly those farrowing late in spring, do not have a second litter during the season.

Data from Pig Recording Clubs

Analysis of the records of 467 litters recorded by the Waikato Pig Recording Club in the years 1932-33 and 1935-36 showed that the average number of pigs born per litter was 9.3 and 7.3 were weaned, showing a loss of 22.7 per cent. up to the weaning stage. Of the 4414 pigs born 974 perished before the weaning stage and the causes of loss recorded for these are given in Table 2.

TABLE 2—CAUSES OF DEATHS IN LITTERS

Cause	No. of pigs	Per cent. of total loss
Overlain	422	43.3
Born dead	312	32.0
Died at birth	120	12.3
Bad doers or runts (died or destroyed)	78	8.0
Other causes	42	4.4
	974	100.0

An interesting feature of the records shown in Table 3 is the wide range of difference in the number of losses in different litters. Highest percentage losses did not occur in large litters, as one might expect, but in the smaller litters. The explanation of this, which may be confirmed in a larger survey, is probably that the influence of good all-round management is not only reflected in small losses, but in large litters of heavy pigs born and heavy weaning weights. The average losses in all litters up to 250lb. was 32.6 per cent., as against only 13.7 per cent. for all litters above that weight at 8 weeks.

TABLE 3—RECORDS OF 467 LITTERS GROUPED ACCORDING TO 8 WEEKS WEIGHT

Total litter weight at 8 weeks	No. of litters	No. of pigs		Per cent. loss to weaning
		Born	Weaned	
101-150lb. ..	46	8.8	4.3	51
151-200lb. ..	82	8.0	5.6	30
201-250lb. ..	101	9.1	6.8	25
251-300lb. ..	105	9.5	7.9	17
301-350lb. ..	76	10.5	9.3	11
351-400lb. ..	38	11.0	9.5	13
401-450lb. ..	19	11.2	10.6	5

Official Litter Recording

An analysis of the 1325 litters for which results have been published under official litter recording shows that of 12,411 pigs born 2556 were lost before weaning. These losses represent 20.6 per cent. of the total births, which is slightly better than the average of all those for which litter recording information is available. The difference is not as great as might be expected in view of the fact that sows nominated for official recording were more than likely given special management. However, here again there are wide variations in the records both between individual sows and between farms that indicate differences in management efficiency. There are also breed differences, the Large Black showing highest losses of 25.9 per cent., with an average of 7 pigs reared. The Large White makes up for a 22.6 per cent. loss by greater prolificacy and weans 8.6 pigs on an average, and the Berkshire, which shows the smallest percentage of losses, 19.3 per cent., weans 7.5 per cent. The Tamworth, with 19.9 per cent. losses, averages 7.1 pigs reared.

Pig Census Records

The importance of management is further emphasised by consideration of data yielded by the pig census, collected by the Department between 1938 and 1943. These are the only data available for a considerable number of farms which record complete details of pig production, including losses beyond the weaning stage. In the earlier years of the census no attempt was made to separate losses to weaning from those occurring after, and, as shown in Table 4, this distinction was made only in the final year. The rising tendency shown by the percentage losses on these farms, which, though nearer to being farms representative of the industry as a whole, are probably still above average, reflects a slackening of interest in pigs which has taken place over the period covered. As the sow population was falling at the same time, the deterioration in management efficiency indicated by the records would, if they were reliable, obviously be serious to the industry as a whole.

The number of farms given in Table 4 for 1943 is probably too small to enable any general conclusion on causes of losses to be reached, but the extent of losses in the earlier years corresponds with the number of losses shown under litter recording.

TABLE 4—LOSSES OF PIGS IN 1938, 1940, AND 1943

Year ending May 31	No. of farms	No. of breeding sows	No. of litters	No. of pigs			Percentage loss	
				Born	Loss to weaning	Total loss	To weaning	Total
1938 ..	200	923	?	12,367	?	2,698	?	21.8
1940 ..	223	1,089	?	15,338	?	3,835	?	25
1943 ..	49	230	358	3,273	883	983	27	30

TABLE 5—AVERAGE PRODUCTION PER SOW ON FARMS GROUPED ACCORDING TO PIG MEAT PRODUCED PER 100lb. BUTTERFAT

lb. pig meat per 100lb. butterfat	No. of pigs per sow				No. of sows	Percentage loss
	Born	Bought	Sold	Died		
Over 80 ..	14.0	0.9	13.4	1.4	29	9.4
61-80 ..	13.4	2.2	12.7	2.3	153	14.7
41-60 ..	13.1	1.4	11.3	2.7	294	18.6
21-40 ..	13.9	1.9	10.5	3.5	317	22.2
Up to 20 ..	11.1	1.5	8.3	3.5	54	27.8

TABLE 6—LOSSES OCCURRING IN DIFFERENT QUARTERS OF 1943

Quarter ended	Percentage of births in year	Losses to weaning		After-weaning losses as percentage of year's loss
		Percentage of births in quarter	Percentage of year's losses to weaning	
August 31	36	30.6	40	28
November 30 ..	19	25.0	17	33
February 28 ..	33	25.4	31	19
May 31	13	23.9	12	20

The relationship between high numbers born and low-percentage losses can be explained only in terms of management efficiency. This is confirmed by Table 5, which is based on the analysis of pig census data from 182 farms and in which the standard of management efficiency is measured by the quantity of pig meat produced per 100lb. of butterfat.

It is important to know the incidence of losses in litters born at different seasons of the year and of post-weaning losses on this basis. An analysis of these losses on the 49 farms covered in the 1943 census indicates that records from really representative farms would yield helpful information. Table 6 shows the losses in litters born that were recorded for the 49 farms in 1943.

As the 230 breeding sows on the 49 farms averaged just over 1.5 litters each in the 12-months period, it appears that some sows were not mated for a second litter or else on disposal after a spring litter some sows may not have been replaced until autumn for the next spring farrowing. Nevertheless the concentration of the farrowings in winter and again at the peak of dairy production is interesting. Though losses of suckers are highest during the winter months, as might be expected, those among weaned pigs are highest during spring, when dairy by-products are increasing rapidly. It would be interesting to study the differences between individual farms in relation to type of farrowing accommodation on the one hand, and management, aimed at avoiding overfeeding with milk or whey in the spring, on the other.

Farmer's Part in Survey

It is apparent from the records at present available on the causes of losses in litters that if more information could be obtained from a sufficiently-large number of representative farms, data could be compiled which would form the basis for part of a sound and progressive policy for the advisory service to producers.

The data can be supplied only by farmers themselves, and those who cooperate in this survey will find that the information they record is a great help in their own management. Collectively the records will be invaluable to the industry. A group of farms has been drawn by ballot for the survey, and those farmers involved are asked to assist by playing their part in the scheme.

District pig council supervisors will call on those farmers drawn in the ballot and will explain the simple records that are required, including particulars of each farrowing and losses on the sow, losses after weaning, and brief particulars of the sow herd.

The essential work, particularly in recording losses, is to keep entries up to date; whenever there is anything to record entries should be made on the shed sheet provided.

Members of young farmers' clubs should be encouraged to keep these records and possibly give talks to their clubs at the end of the year about the results they have obtained.

From this survey other investigations will start, and members of young farmers' clubs who become interested at this stage can be of great assistance to the industry in the future.

Meat Cookery

TENDER cuts of meat are also the most expensive, so it is important to the housewife to know how to cook the cheaper and tougher cuts, especially as the food value of the less tender meat is equivalent to that of the most tender. Nutritionally, nothing is lost when less expensive cuts of meat are bought, and they may be made as appetising as the tender cuts when prepared suitably. Advice on the subject is given in this article by Edith G. McNab, Rural Sociologist, Department of Agriculture, Dunedin, who discussed the cooking of the tenderer meats in last month's "Journal."

THE tougher meats can be made tender by cooking them slowly for a long time in moist heat, by mincing or cutting them up before cooking to break up the fibres, or by cooking them with other substances such as tomatoes or vinegar. Avoidance of overheating is important, for cooking at too high a temperature will make the meat proteins tougher. Meat is simmered rather than boiled, or if it is cooked in the oven, a hot oven must be avoided. A pressure cooker is excellent for preparing less tender meats. (The "Journal" for March, 1948, contained an article on the use of pressure cookers.)

Boiling

Though any meat may be cooked by simmering it in water, usually the tougher cuts or meat from older animals is used. Leg or shoulder of mutton, cuts of beef such as brisket, and salted or pickled meats of all kinds—corned beef, salt mutton, pickled pork or ham—may be boiled. Very salt meat may be soaked overnight in cold water and the water discarded before the meat is cooked. The meat is usually at least half covered with boiling water, brought just to the boil, and simmered, not boiled hard. The saucepan is kept covered. Vegetables may be added to the meat for the last hour, or less for vegetables which cook quickly. The stock from boiled fresh meat may be used for soups and gravies, but the stock from pickled meat may be too salt to use. The cooking time depends on the size of the piece of meat. A leg of mutton will take 3 to 3½ hours, and a 4lb. piece of beef 3 to 4 hours.

Cured meats such as corned beef or ham which are to be served cold are best cooled in the cooking water. Corned beef is covered with cold water instead of hot, then brought to the boil. An onion, 1 or 2 cloves, and a tablespoon or 2 of vinegar may be added to corned beef. For corned beef allow 30 minutes' cooking for each 1lb. of meat and 30 minutes more.

Pot Roasting

Long, slow cooking in a covered pan is the basis of pot roasting. The piece of meat chosen should be compact in form, and a heavy saucepan should be used. The meat is browned in a small amount of fat, any excess fat is poured off, and the saucepan is covered closely to keep in the steam. Cooking time is longer than for a roast of comparable size in the oven. Allow a 4 to 5lb. roast 3 or 4 hours to cook. If desired, about ½ cup of water may be added to the meat before the saucepan is covered, and a low rack may be placed under the meat after it is browned. Meat may be stuffed before being pot roasted.

If desired, vegetables may be added and cooked with the meat during the last part of the cooking time. Any root vegetables, tomatoes, or celery may be used.

Stewing and Braising

Stewing and braising are similar methods of cooking, the term braising being used when the meat is left in large pieces—say, 1 or 2 pieces per serving. Both ways depend on long, slow cooking in liquid, which is usually water or stock. The leaner cuts from the flank, shin, and neck

Heading photograph by Sparrow Industrial Pictures Ltd.

are suitable for stews. The pieces of meat are trimmed, if necessary, to remove excess fat, dipped in flour, and browned on all sides in a little hot fat. The fat is drained off before liquid is added. For beef stews the pieces are cut into ½ or ¾in. cubes. The seared and cut-up meat is almost covered with cold water in a saucepan and simmered until it is tender. Two to 3 hours or longer may be required. Vegetables may be added to stews long enough before serving time to allow for their being cooked by the time the meat is ready. A stew should be well seasoned, and the gravy may be thickened with flour mixed to a smooth paste with cold water and added shortly before it is served.

Meat may be stewed or braised in a covered casserole in the oven instead of in a saucepan.

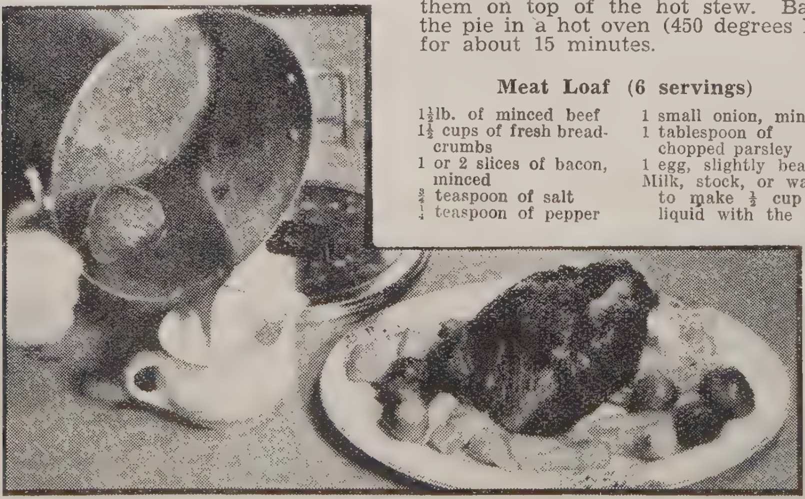
Recipes

The cup referred to in the following recipes is a standard 8oz. measuring cup, and all measurements are assumed to be level.

Swiss Steak (6 servings)

2lb. of lean topside steak cut in slices 2in. thick
2 tablespoons of fat
¼ cup of flour
1 teaspoon of salt
⅛ teaspoon of pepper
1 medium-sized onion, sliced
1 cup of tomatoes (preserved whole, puree, or juice) or ½lb. of fresh tomatoes.

Pound the seasoned flour into the steak. Sear the pieces of meat in the hot fat. Cut the meat, allowing 1 or 2 pieces to each person. Place the pieces in a casserole, add the onion and tomato, and add water if necessary almost to cover the meat. Cover the casserole and bake the steak for 2 hours at 300 degrees F. The steak may be cooked on top of the stove by simmering it in a closely-covered saucepan for about 2 hours. If the steak is cut thinner, the cooking time may be reduced slightly.



[*Sparrow Industrial Pictures Ltd. photo.*

Topside, pot roasted with onions and garnished with small carrots.

Haricot Stew (6 servings)

6 mutton chops, leg or neck
1 large carrot, sliced
1 medium-sized onion
½ cup of turnip
¼ to ⅓ cup of flour
1½ to 2 cups of stock or water
1 teaspoon of salt
⅛ teaspoon of pepper
3oz. of haricot beans, soaked

Trim the fat from the chops if necessary. Dip them in the seasoned flour, brown them in a little fat, and put them in a saucepan. Add the vegetables and stock, and simmer the stew for about 3 hours. Thicken it shortly before it is served with the remaining flour mixed to a smooth paste with a little cold water.

Flavour may be added by browning the onion slices in fat before adding them to the stew. When time is short beef may be made into stew without first being browned without any significant loss of appearance, though there is a slight loss of flavour.

Dumplings for Serving with Stews (6 servings)

1 cup of sifted flour
¼ teaspoon of salt
2 teaspoons of baking powder

Mix the ingredients to a soft dough with milk. Drop the dough by spoonfuls on top of the simmering stew 20 minutes before serving time. Cover the stew closely and let it simmer without lifting the lid again until it is ready to serve.

The dumpling mixture may be varied by adding chopped parsley or other herbs.

Meat Pie with Scone Crust (6 servings)

Prepare a stew using 1½ to 2lb. of mutton, beef, or veal cut into ½ to ¾in. cubes. Cook it in a casserole, or in a saucepan from which the hot stew is turned into a casserole or piedish. Have ready the scone mixture, made as follows:—

2 cups of sifted flour
4 teaspoons of baking powder
½ teaspoon of salt
2 tablespoons of shortening

Rub the shortening into the dry ingredients and mix them to a soft dough with milk. Roll the dough ½in. thick, cut it into rounds, and arrange them on top of the hot stew. Bake the pie in a hot oven (450 degrees F.) for about 15 minutes.

Meat Loaf (6 servings)

1½lb. of minced beef
1½ cups of fresh breadcrumbs
1 or 2 slices of bacon, minced
¾ teaspoon of salt
¼ teaspoon of pepper
1 small onion, minced
1 tablespoon of chopped parsley
1 egg, slightly beaten
Milk, stock, or water to make ½ cup of liquid with the egg

Combine all the ingredients. A small quantity of celery or tomato may be added if available. Turn the mixture into a well-greased loaf pan and bake it in a moderate oven (350 degrees F.) for about ¾ hour. When it is cooked turn it out on to a hot plate and serve it with gravy.

Cooking of Organs

Organs such as liver and kidneys are valuable foods because they provide more minerals and vitamins than does ordinary meat. Liver, especially, should be used regularly, for it is rich in iron in a form which is easily used by the body. Lack of iron is one of the causes of anaemia, and it is wise to include in the menu foods which are rich in readily-available iron. Other meats rich in iron are kidneys and heart. Tongue and heart, being muscular organs, are similar to lean meat in food value, except that heart is richer in iron. Organs contain little fat so may have fat added in cooking.

Liver and kidney are tender, so any method of cooking other tender meats may be used. Care needs to be taken to prevent their drying out during cooking and to prevent their being overdone by cooking for too long or at too high a temperature. Liver should not be cut too thin; the slices should be at least ½in. thick. When being grilled liver or kidneys may be brushed with bacon fat or butter, or pieces of bacon may be skewered between the pieces to supply some fat and help prevent too much drying. As well as being grilled or fried, these organs may be stewed or cooked in a casserole, and liver makes a good meat loaf.

Tongue and heart need long, slow cooking in moist heat, as they are not tender. Tongue may be served hot or cold, and heart is often stuffed.

Brains and sweetbreads (the thymus glands of calves) will not keep for very long, so they should be cooked as soon as possible. They are parboiled for 20 minutes in water to which vinegar and salt have been added (1 tablespoon of vinegar and 1 teaspoon of salt to 1 quart of water). The cooking water is drained off and the brains or sweetbreads are covered with cold water. When cool, the membranes are removed, and then cooking can be completed by any method desired. Ways which add flavour and richness are best—for example, braising in rich gravy, creaming in white sauce, or frying.

Liver and Bacon (6 servings)

1½lb. of liver in ½in. slices
6 slices of bacon
1 egg, slightly beaten
½ teaspoon of salt
⅛ teaspoon of pepper
Dried breadcrumbs

This is a variation of the popular fried liver and bacon. The liver from any animal can be used, though lamb's liver is usually regarded as superior to beef liver. Beef liver is not quite so tender and rather coarser in texture, but it is good for casseroles and liver loaf.

Prepare the liver by pouring boiling water over it, then removing the skin and any large vessels. Cut it into pieces for serving, remembering not to make the slices too thin. Add the seasonings to the egg. Dip the pieces of liver in egg and then in crumbs. Place them in a baking pan with

[*Sparrow Industrial Pictures Ltd. photo.*

Meat loaf, the main ingredients of which are minced beef, breadcrumbs, and bacon.

enough fat to cover the bottom of the pan. Put a slice of bacon on top of each piece of liver. Bake them in a slow to moderate oven until the colour of the liver is just changed and the bacon is cooked. Take care not to overcook. If desired, serve gravy with the liver and bacon.

Kidney Stew (6 servings)

3 beef or 9 lamb kidneys
3 tablespoons of butter or bacon fat
1 teaspoon of salt
⅛ teaspoon of pepper
¼ cup of flour
1 small or medium-sized onion, cut finely or minced
2 cups of water or stock

Cut the kidneys in halves lengthwise and remove the centre part and skin. Cut up the kidneys and fry them with the onion in the fat. Add the flour, and cook the ingredients until they are brown. Add the stock and seasonings, simmer the stew for 10 to 15 minutes and serve it on toast.

Pressed Tongue

1 ox tongue
1 onion
¼ cup of vinegar
4 cloves

Wipe the tongue, and remove some fat if there is too much on it. Cover it with cold water, add the onion, vinegar, and cloves, and simmer it, allowing 20 minutes for each 1lb. and 20 minutes more. When the tongue is cool enough to be handled remove it from the liquid, trim off skin, gristle, and small bones at the roots, and press the tongue in a bowl. Add enough liquid to cover it, adding 1 dessertspoon of gelatin to each cup of liquid used. The gelatin is best soaked in a little cold liquid, then dissolved in the remainder of the liquid heated to boiling point. When set, the tongue may be turned out of the bowl and sliced.

Stuffed Heart

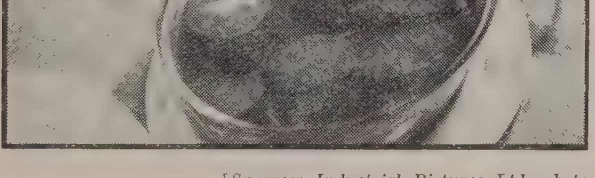
Remove the large veins and arteries, and wash out the heart. Fill it with bread stuffing made using the recipe in last month's article. Make sure the stuffing is well seasoned. Sew the heart up, roll it in seasoned flour, and brown it all over in a little hot fat in a frying pan. Place the heart in a casserole or deep baking dish and pour in 1 cup of boiling stock or water. The meat should be about half covered by the liquid. Cover the dish and bake the heart in a moderate oven (350 degrees F.) until it is tender—about 2 hours. Serve it with gravy made from the cooking liquid.

Heart is carved crosswise and in thicker slices than are usual for other meats. The number of servings depends on whether it is beef, calf, or sheep's heart.

Preparation of Soup Stock

The bones and trimmings of meat and tough cuts may be used to make soup stock. The aim is to extract as much flavour and food value as possible from them. The meat is cut up and the bones are broken to provide a greater surface area from which the water may dissolve food substances. If brown stock is wanted, the meat is browned before being cooked. Then the meat and bones are covered with cold water to which a little salt has been added, and the whole is simmered for 3 or 4 hours or longer. Some of the proteins of the meat are broken down to gelatin by the long cooking in liquid and will then dissolve into the water.

After being cooked the stock is strained, and if it is to be kept a short time, the fat is left as a layer on top to help prevent spoiling. In any case the easiest way to remove the fat is by lifting it off when it solidifies. If much gelatin is present, the stock may set, but it will melt again when reheated. Once the fat is removed the stock is ready to be used for soup making.



[*Sparrow Industrial Pictures Ltd. photo.*

Swiss steak.

Knitted Gloves

HOWEVER perfect a woman's suit, smart accessories are needed to complete the picture, and if they are smart enough they can lift it out of the ordinary. Such a role can be filled by the gloves in the illustration — featherweight gloves of scarlet or bright red knitted in a lacy stitch. With a tension of 17 stitches to 2in. on No. 12 needles, 1oz. of two-ply wool will make these gloves to fit size 6½ to 7.

ABBREVIATIONS used in the pattern are: K. = knit; p. = purl; sts. = stitches; tog. = together; m. = make (by putting wool over or round needle); patt. = pattern.

Left Glove

Cast on 52 sts. and work in ribbing thus—First row: K. 1, * p. 2, k. 2; repeat from * finishing k. 1 instead of k. 2. Second row: P. 1, * k. 2, p. 2; repeat from * finishing p. 1 instead of p. 2. Repeat these 2 rows for 2½in., ending with a second row, then work in patt. as follows:—First row: K. 1, * m. 1, p. 2 tog., k. 2, repeat from * finishing k. 1 instead of k. 2. Second row: P. 1, * k. 2, m. 1, p. 2 tog.; repeat from * to last 3 sts., k. 2, p. 1. These two rows form one pattern. Repeat them six times more. Next row: Patt. 24, turn, leaving remaining sts. on a spare needle. Continue on these 24 sts. until the 36th row has been worked. Leave these sts. on a spare needle and work on second set of sts. until 36th row has been worked. Place all sts. on one needle and continue in patt. on these 52 sts. until the 50th row has been worked from beginning.

First finger.—Patt. 33, turn, leaving remaining sts. on a spare needle. Next row: Cast on 2, * k. 2, m. 1, p. 2 tog.; repeat from * until there are 16 sts. on needle, turn, leaving remaining sts. on a second spare needle. Next row: * k. 2, m. 1, p. 2 tog.; repeat from * to end. Repeat this row until finger measures 2¾in., then shape top thus—Next row: Take 2 tog. right across. Next row: Take 2 tog. right across. Break off wool, leaving an end. Thread end through remaining sts., and draw up tightly. Fasten off. Join seam of finger.

Second finger.—With right side of work facing, pick up and k. 2 sts. at base of first finger, then from sts. on first spare needle m. 1, p. 2 tog., k. 2, m. 1, p. 2 tog., k. 1, turn. Next row: P. 1, * k. 2, m. 1, p. 2 tog.; repeat from * twice more, k. 2, p. 1, turn. Next row: K. 1, * m. 1, p. 2 tog., k. 2; repeat from * twice more, m. 1, p. 2 tog., k. 1. Continue in patt. on these sts. until finger measures 3¼in., then shape top and finish as for first finger.

Third finger.—With right side of work facing, pick up and k. 4 sts. at base of second finger, then from sts. on first spare needle k. 1, m. 1, p. 2 tog., k. 2, p. 1, turn. Next row: K. 1, * m. 1, p. 2 tog., k. 2; repeat from * twice more, m. 1, p. 2 tog., k. 1, turn. Next row: P. 1, * k. 2, m. 1, p. 2 tog.; repeat from * twice more, k. 2, p. 1. Continue in patt. on these sts. until finger measures 2¾in., then shape top and finish as for first finger.

Fourth finger.—With the right side of work facing, pick up and k. 4 sts. from base of third finger, then from sts. on first needle p. 1, k. 2, m. 1, p. 2 tog., k. 1, turn. Next row: P. 1, * k. 2, m. 1, p. 2 tog., repeat from * twice more, k. 2, p. 1, turn. Next row: K. 1, * m. 1, p. 2 tog., k. 2; repeat from * twice more, m. 1, p. 2 tog., k. 1. Continue in patt. until finger measures 2¼in., then shape top and finish as for first finger. Join seam to wrist edge.

The thumb.—Cast on 4. First row: K. twice into 1st st., k. 1, m. 1, p. 2 tog. Second row: K. twice into 1st st., k. 1, m. 1, p. 2 tog., k. 1. Third row: K. twice into 1st. st., k. 2, m. 1, p. 2 tog., k. 1. Fourth row: K. twice into 1st st., k. 2, m. 1, p. 2 tog., k. 2. Fifth row: K. twice into 1st st., p. 1, k. 2, m. 1, p. 2 tog., k. 2. Sixth row: K. twice into 1st st., p. 1, k. 2, m. 1, p. 2 tog., k. 2, p. 1. Seventh row: K. twice into 1st st., m. 1, p. 2 tog., k. 2, m. 1, p. 2 tog., k. 2, p. 1. Eighth row: K. twice into 1st st., m. 1, p. 2 tog., k. 2, m. 1, p. 2 tog., k. 2, m. 1, p. 2 tog. Continue in this way, increasing 1 st. at beginning of every row until there are 20 sts. on the needle. Work a further 2¼in. on these sts., then shape top and finish as for first finger. Join seam of thumb, try on glove and thumb, and sew thumb in place on slit in palm.

Right Glove

Work as for left-hand glove until 7 patts. have been worked from beginning, then divide sts. for thumb opening as follows:—Next row: Work 28 sts., turn, leaving remaining sts. on a spare needle. Continue on these 28 sts. until the 36th row has been worked. Leave these sts. on a spare needle and work on second set of sts. until 36th row has been worked. Place all sts. on one needle and continue as given for right-hand glove.

Press the gloves very lightly under a damp cloth, avoiding the ribbed cuffs.

To simplify the pattern remember that the 2 k. sts. of the previous row are the sts. to be purled together in the following row.

Spring Flowers Depend on Autumn Plantings

THOUGH full use should be made of permanent plants like trees and shrubs, which do much to add character to the garden, borders can be kept full of flowers only by continually setting out new plants to grow and flower in succession as the current flowering plants fade. The autumn planting is important, as next spring's display of flowers depends on what is set out now. Planting out is one of the main tasks described in these reminders about April's work in the flower garden by J. P. Hudson, formerly of the Horticulture Division, Department of Agriculture, Wellington.

BEGONIAS in pots should be dried off gradually by giving them less and less water until the leaves and stems turn yellow. When the plants are quite dormant the pots should be put on their sides in a dry, frost-proof place or the corms removed gently from the soil and stored for the winter. Fibrous-rooted begonias should be lifted from the borders when autumn frosts cause growth to cease for the year, set closely in boxes, and stood in a sheltered, frost-free place for the winter. The plants can be started into growth next spring and new plants propagated from cuttings.

Boxes used for seed sowing and growing bedding plants will last for several seasons, even if made from scrap timber, if they are treated with certain preservatives which prevent the wood from rotting without having any harmful effect on the roots of plants grown in the boxes. Two preservatives are in common use, one containing 25 per cent. copper naphthanate and the other 5 per cent. pentachlorphenol. Both these are readily obtainable as proprietary preparations. The treatment recommended is to dip the seed-boxes after making them up (or garden stakes) for 3 minutes in the preservative and then allow them to dry before use. One dressing should preserve the boxes for some years. Galvanised nails are better than ordinary box nails for making up seed-boxes.

Bulbs in bowls, potted up and stood out in a cool place to root, should be cleaned up and taken into the house 6 to 8 weeks after being potted. They should be put in a cool room at first and watered sparingly. If bowls of bulbs are not given this period of rooting at a low temperature, the leaves start to grow before there is an adequate rooting system to support them, and the flowers are not as fine as they should be. Dutch iris also flower well in bowls of fibre or, preferably, in pots filled with good compost. Wedgwood is an excellent blue, and there are also yellow varieties.

Bulb planting should be concluded in April, except in the warm northern districts, where tulips are better kept in a cool place until May before being planted out. There is no point in keeping bulbs out of the ground longer than necessary, as they shrivel and deteriorate, and bulbs not planted at the proper time cannot be held over until the following season like many sorts of seeds. Gardeners who are usually troubled with stripe (breaking) of tulips or with tulip fire disease should refer to the description of these troubles and their control in the July, 1948, issue of the "Journal."

Chrysanthemums should continue to be disbudded as the flower buds develop. Though stems with a single bloom are usually considered best for cutting, there is no need to take off too many buds from plants grown solely for border display. However, it pays to remove a proportion of buds even from border chrysanthemums, especially the buds growing from the stem below the main flower cluster, and also to remove side shoots growing from lower down the stems. That involves a certain amount of trouble but much improves the appearance of the plants when in flower, giving them more "character." Chrysanthemums which have not been disbudded tend to look very straggly and formless. Chrysanthemums not yet fully staked should be supported at once, as the stems rapidly become top heavy when the flower buds swell. Stems that could stand up to wind before the buds developed are easily blown over when carrying large flowers. In districts liable to heavy frosts the late varieties of chrysanthemums can now be wrenched, lifted, and carefully replanted in a

Heading photograph by Sparrow Industrial Pictures Ltd.

WORK IN THE FLOWER GARDEN

[Douglas Elliott photo.

Viburnum rhytidophyllum **is a shrub which has large, glossy, corrugated leaves, and large, flat heads of white flowers in early summer, followed in autumn by a profusion of berries which are red at first and later turn black.**

glasshouse or in a sunny, sheltered place where the blooms can be protected from frost. Do not pack plants too tightly together or the leaves will be attacked by chrysanthemum mildew. Chrysanthemums growing in pots should be fed regularly with liquid manure, and a careful search should be made for caterpillars, which at this time of year can quickly ruin flowers by nibbling off their petals.

Dahlia roots are tender and are killed by hard frost. In cold districts where the ground is likely to freeze hard in winter dahlias should be cut down to about 6in. above the ground before the first hard frost is likely and after the plants have finished flowering. Labels should then be tied to the bases of the stems to identify the varieties, and the tubers lifted carefully with a spade and set aside in an airy, frost-free place to dry. When dry the roots should be stored for the winter in a cool shed where they will be safe from frost. In most districts in New Zealand the roots can safely be left in the ground for the winter, but lifting and storing them leaves the ground clear for digging over in winter and avoids the risk of losing the roots in winters which are exceptionally severe for the district.

Deciduous trees are the glory of the autumn, when their leaves change colour, but all too few have been planted in New Zealand. Far too many town streets and stretches of countryside are dominated by evergreen trees, and it is high time that New Zealanders realised the importance of planting suitable deciduous trees to frame the lives of the next generation. Four times a year, in spring, summer, autumn, and winter, deciduous trees undergo transformations that prevent the countryside from ever becoming dull, whereas the sombre hue of most evergreens changes little from season to season. In autumn, when deciduous leaves fall, gardeners should not neglect to collect them, as leaves are most valuable as a source of humus if put on the compost heap.

"Drying off" is a term applied to a natural process which gardeners should understand. Many plants become more or less dormant at certain times of the year, usually during a season when conditions are not suitable for growth. In cold countries many plants die down to the ground every autumn, but their roots survive the winter, snug in the ground, to send up new shoots the following spring; such plants are called "herbaceous perennials." Some trees and shrubs the branches of which persist through the winter drop all their leaves in autumn, and so avoid the need to take up water from the cold or frozen soil in winter. On the other hand, many of the flowering bulbs grow in countries where the summers are very hot and dry, so the plants have adjusted their lives to growing in winter and spring and hibernating during summer. In all these cases the period of rest is necessary for the well-being of the plants, and gardeners who grow these plants must make provision for them to go to rest at the proper season of the year. Such plants as begonias, gloxinias, and achimenes which have been growing in pots through the summer should now be gradually "dried off" by giving water less and less frequently until the leaves have fallen and the stems died. The roots should then be kept dry through the winter.

Fuchsias growing in pots are usually dried off in the same way, though the soil in the pots should not be allowed to become completely dry. If desired, pot fuchsias can be kept growing all through the winter on a sunny windowsill, and often will bear flower buds, though these usually fall off before they open. The plants should be kept drier than during summer and autumn and pruned back hard in spring to start them into growth again and prevent them from becoming too large for use in the house. In very cold inland situations where fuchsias growing outside are likely to die out in winter, a pile of soil, straw, old cinders, or compost should be moulded over the roots to protect them from frost, but that precaution is necessary only where winters are extremely cold.

Pelargoniums make a bright show all through spring, summer, and autumn and should be grown much more widely, especially in borders that tend to dry out in summer. The light-coloured varieties are the most useful for garden planting, making a brighter display than varieties with dark red and purple flowers.

WORK IN THE FLOWER GARDEN

[*Douglas Elliott photo.*

***Spiraea japonica* Anthony Waterer is a neat deciduous shrub growing up to 3ft. high which is useful even in small mixed borders. It bears bright red flowers and curious, variegated shoots.**

Gladioli should continue to be lifted and dried off when the leaves show an obvious change of colour, and plants lifted earlier and now dried off can be prepared for storage by cutting off the leaves an inch or so above the corms and rubbing off the old shrivelled corm. The skins should not be removed until spring, as corms keep better in store with their skins in place. Seedlings sown last month should be kept growing strongly until they each have 2 leaves, after which they should be watered less and less and gradually dried off.

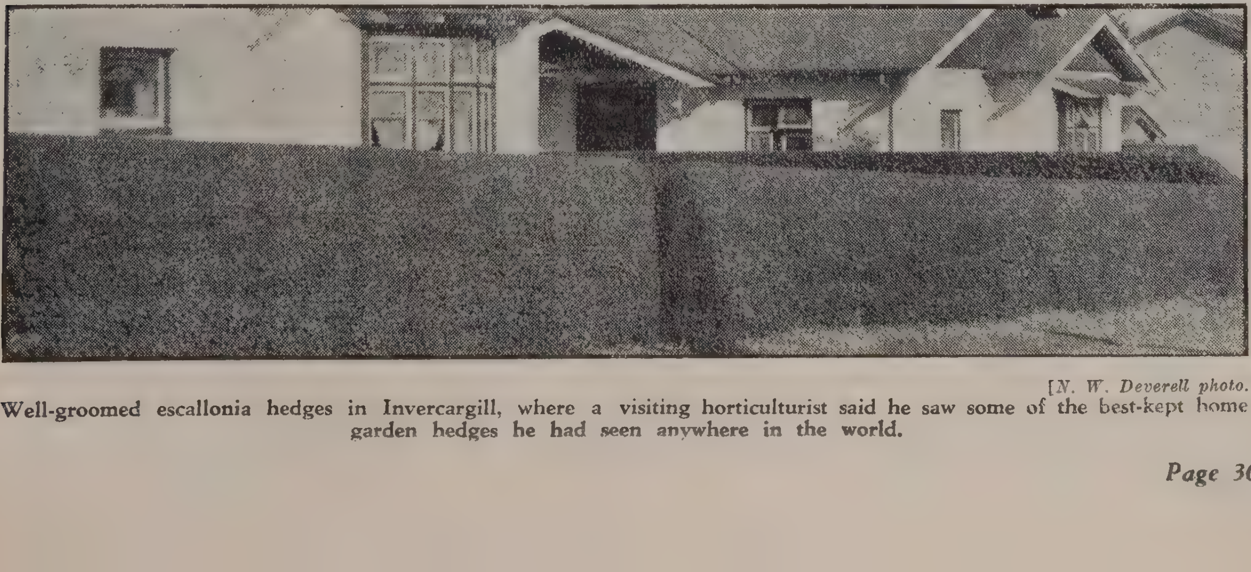
Herbaceous perennials which have finished flowering should be cut down to within a few inches of the ground, the stubs being left to mark the positions of the roots. Plants which have been in for several years and need dividing can be lifted now, the ground dug over, and well-rooted pieces of the plants replanted. Gaps in the border can also be planted up now, making proper use of the perennial scabious, pyrethrums, delphiniums, aquelegias, and perennial phlox, all of which are worth a place in every mixed border and do not spread unduly like some varieties of perennial asters (michaelmas daisies) and heleniums.

Nurserymen like to receive orders for trees, shrubs, and herbaceous plants as early as possible. As the planting season will soon be here, it is advisable to place orders now for plants that are to be bought in and so avoid disappointment. Stocks of the best varieties are sometimes limited.

Peat of a suitable grade has many uses in horticulture. Overseas, really good moss peat is offered for sale by seedsmen, and home gardeners buy in supplies for mixing with loam and sand when making up seed-sowing and potting composts, the texture and quality of which are much improved by the addition of a proportion of peat. Peats of a suitable grade are not on sale in New Zealand at present, though it is likely that they could be found in the Dominion and marketed at a reasonable price. The ideal peat for horticultural purposes is fibrous, non-greasy, free from dust, and not too acid. Samples of peat of the sort used overseas are available at the office of the Horticulture Division, Wellington, for inspection by anyone who is interested in finding and marketing peat for horticultural purposes.

Plant out cuttings from the frame as they root, and Iceland poppies and other seedlings from the boxes in which they have been grown. Sturdy antirrhinum seedlings found growing in the borders can be transplanted to fill up gaps, and all pansy, viola, Canterbury bell, gaillardia, and hollyhock plants still growing in the frame or nursery bed should be planted into the borders to flower next year.

Pot plants growing in the house should be washed by being held upside down under a cold tap. This washes off pests such as red spider, thrips, and aphis and freshens up the plants. Leaves which show small, whitish dots on their upper surfaces or become rusty coloured indicate that red spiders are feeding on the under sides. The red spiders can be seen with the naked eye, often moving beneath a thin webbing, but they are very small and the name is a misnomer, as the creatures are light brown at most seasons. Pot plants still growing strongly should be fed regularly with liquid manure or complete fertiliser of a suitable grade. Geraniums and balsams which have grown too big to be accommodated on windowsills should be pruned hard, the old leggy growths being removed; new shoots will soon grow from the bases of the plants. If plants are grown in a window where blinds are drawn at night, it is worth while to have the window ledge widened by the addition of a strip of wood so that the pot plants can stand well away from the window and the blinds do not touch the pots when pulled down. If blinds or fringes come into contact with the pots, they absorb moisture



[*N. W. Deverell photo.*

Well-groomed escallonia hedges in Invercargill, where a visiting horticulturist said he saw some of the best-kept home garden hedges he had seen anywhere in the world.

laden with certain chemicals that may stain the fabric and are hard to remove. Moreover, the chemicals are hygroscopic (that is, they absorb moisture from the air) and prevent the stained places from drying out. In any case, plants grow better if the leaves do not touch the glass.

Shrubs which are to be moved and were partly wrenched last month should now be further prepared by wrenching the remainder—that is, the rest of the shrub should be dug round and the remaining roots severed some distance from the trunk. The shrubs, which should not be moved for a further 6 or 8 weeks after being wrenched, will now have little anchorage and should be supported with strong stakes to prevent them from being blown over in a gale.

Stakes can be preserved as described for boxes by dipping them in a proprietary wood preservative. Another very satisfactory way of lengthening the life of manuka stakes is to dip them in creosote and then plunge the butts into hot tar for the depth to which they will be embedded in the ground. The grower who recommended this treatment said stakes treated that way would last for at least 8 years if they were stacked off the ground when not in use.

Plants to Propagate this Month to Ensure a Garden Full of Flowers

Buds inserted earlier should now be established. Cut the ties before the swelling stems cause them to bite into the bark.

Cuttings of many perennial plants such as geraniums, hybrid wallflowers, catmint, and marguerites will still root if put in cold frames. Viola cuttings may also be taken, using only young, strong shoots. This is the season to start taking hard-wood cuttings of shrubs, each 6 to 10in. long, with the lower leaves removed in the case of evergreen species. Among the many shrubs easy to propagate in this way are *Lonicera nitida*, escallonia, privet, and flowering currant. (A hard-wood cutting is one in which the whole stem is woody to the tip.) The cuttings should be inserted firmly in the soil with about half their lengths buried.

Lift, divide, and replant pinks, double daisies, and herbaceous perennials which have finished flowering.

Plant out cinerarias (in a semi-shady place), Iceland poppies, forget-me-nots, wallflowers, and other bedding plants that will make a showy display in spring. Planting should be done as soon as the summer bedding plants and annuals have been removed to give the new plants the benefit of the warmth which is still in the soil. If planting is delayed unnecessarily, the plants have less chance to become well established before the cold weather sets in.

Sow a further batch of annuals for early flowering in the warm northern districts where most of the hardy annuals will grow steadily all through the winter.

Sow, Plant, or Propagate Something Every Month

"Wilting" is an interesting phenomenon. When in active growth plants are continually taking water from the soil, passing it up through the roots and stems to the leaves, and then transpiring most of it from the leaves in the form of water vapour. Plant foods taken from the soil are passed to all parts of the plant in this stream of water. The amount of water taken up by plants is surprising. An average-sized cabbage takes up about 40 gallons from the soil during its life, and trees may absorb thousands of gallons a year, losing most of it again from their leaves. When a plant is healthy there is a balance between the amount of water taken up and the amount lost from its leaves. Sometimes that balance becomes upset, and the plant transpires more water from its leaves than its roots are taking up from the soil. When that happens the leaves first shrink a little and then go flabby—that is, they wilt. If the process continues, the stem may wilt also. Plants have a remarkable power of recovering from wilting (as pot plant growers often observe when they water a plant which has wilted), but there comes a point in wilting from which the plant cannot recover, even though it is given water. Wilting may be caused by the roots not being able to take up enough water (for instance, if the soil is too dry or cold or if the roots have been injured) or by the leaves losing moisture too quickly (as on very hot, dry days, especially if a wind is blowing). The remedy is obvious if the soil is too dry. If wilting is caused by the roots having been injured (as when plants are transplanted), the best plan is to cut off part of the top of the plant, removing a proportion of the leaves and so reducing the amount of water lost by transpiration. If wilting is caused by hot, dry conditions accelerating transpiration, plants will usually make a remarkable recovery when the temperature falls in the evening, but some relief can be provided, if necessary, by rigging up a temporary shelter or syringing the plants with water after the sun has set. Plants should not be syringed while the sun is still shining on their leaves.

[*Douglas Elliott photo.*

The African lily (*Agapanthus umbellatus*) grows well in tubs, making a decorative feature in the garden. There are both blue and white varieties. These plants should be left undisturbed in their pots or tubs for a number of years, as they seem to flower better when crowded.

Other Tasks for the Month

Continue thinning **annuals** sown earlier and pull out annuals and bedding plants which have finished flowering.

Take off all faded and **dead flower heads** regularly week by week.

Prune **hydrangeas** in relatively-mild districts if that has not been done, as described last month.

Sow new **lawns** and clip the edges of established lawns.

Plant out **lilies** not later than the end of April.

WASHING by MACHINE

MORE and more New Zealand homes are being equipped with washing machines as they become available. Undoubtedly these machines are well worth while as labour and time savers, especially when washing is likely to be heavy, as in farm households or where there are young children. Good washing machines, properly used, give better results than washing by hand, and washing by machine causes less wear on clothes than rubbing by hand. In this article Edith G. McNab, Rural Sociologist, Department of Agriculture, Dunedin, discusses methods of washing by machine and the advantages and disadvantages of different types of equipment.

[George Weigel photo.

While the machine does the work, other and perhaps more pleasurable tasks may be undertaken.

THE most common type of machine available in New Zealand is that in which the clothes are moved in the tub by means of a gyrator consisting of a vertical shaft fitted with vanes. The gyrator works with half turns, moving alternately backward and forward. The washing action takes place by the movement of both the clothes through the water and the water through the clothes. Various makes of this type differ in efficiency of cleaning and in the amount of wear on the clothes, but usually the cleaning action is satisfactory, and the amount of wear on the clothes is likely to be less with this type of movement than with others.

In another type of machine the clothes are placed in a perforated metal cylinder, which revolves in a tub of water. The cylinder is fitted with baffle plates, and the direction of rotation is reversed at intervals. A third type has vacuum cones on a central vertical shaft, the movement of the cones up and down and around forcing the water through the clothes. These kinds of machines are much less common than the first type described.

Water is removed from the clothes after they have been washed either by passing them through a wringer or by using a spin drier, also called a centrifuge or hydro extractor. A spin drier consists of a perforated metal basket to contain the clothes which is revolved at great speed inside a tub, the water being forced out through perforations into the tub and then draining away.

Filling with Water

For a full load of clothes the machine should be filled to the level marked on it by the manufacturers. If there is not a full load of clothes, the amount of water used may be reduced, but generally the machine is designed to work most effectively when filled to the marked level. No machine should be run when filled above this mark. A piece of hose pipe leading from the water tap to the machine is a convenience for filling it.

The temperature of the water depends on the kind of fabrics to be washed. For cotton and linen the water may be as hot as can be borne comfortably by the hands; in using the non-automatic machines available in New Zealand, the hands must be put into the water to remove the clothes. For rayon, silk, or wool, water should be only luke warm for washing and rinsing.

A New Zealand housewife's dream—an automatic washing machine. The upper door is that of the washer and the lower that of the drainage section.

If the water is hard, the washing water and the water for the first rinse should be softened before use. To do this, washing soda is added to the water in the machine or in the rinsing tub, and time must be allowed for the softening action to take place before the soap is added. The soda should be put in about 5 minutes before the soap or before the rinsing water is required. If the soap is added at the same time as the soda, the water is not softened and some soap is wasted by being changed into an unpleasant scum. This scum, which rises to the surface of hard water when soap is added, clings to fabrics and tends to produce a greyish colour.

When silk, wool, or rayon is being washed, washing soda must not be added to the water, for it has a harmful effect on these fibres.

Choice and Quantity of Soap

For washing cotton and linen, ordinary bar laundry soap may be used if it is heated with water to make a soap jelly, so that it will dissolve easily when added to the water and the machine is run for a minute or two. Soap powder or soap chips are suitable, but care must be taken to have the soap dissolved before the clothes are added. If the water is not very hot, the soap powder or chips are better dissolved in hot water before being added to the water in the machine. For rayon, silk, or wool, only neutral bar soap (of which there is one brand on the market in New Zealand) or neutral soap flakes (of which the New Zealand housewife has a choice) should be used, as for washing by hand.

It is most important to use enough soap to produce good suds when the machine has been run a minute or two. Experiment will decide how much to use, as the amount varies slightly with different water supplies. To begin with, try about 1/6oz. of soap per gallon of water; if that does not maintain a lather of 1 to 2in. during the whole washing process, increase the quantity. Using too little soap is false economy, and is one reason for the disappointing results obtained by some users of washing machines. On the other hand, using too much soap is wasteful, and wasting soap means wasting fat—a precious commodity in some parts of the world. Also, with some types of washing action, too much soap decreases the efficiency of the machine.

Preparing the Clothes

The usual precautions and procedure of the housewife are carried out with the clothes, such as the mending of tears to avoid their being lengthened, the shaking out of dust from pockets or cuffs, and the removal of stains. Food-stained articles may require soaking in cold water. The clothes are sorted in the usual way—white and light-coloured cottons and linens, darker colours, silks and rayons, and woollens. One washing water may suffice for several loads of clothes if it does not become too dirty. Once the water becomes dirty, it is better to run it off and use fresh. The more lightly-soiled articles are washed first, then those which are more heavily soiled. Any garments which have heavily-soiled areas, such as shirt collars, should have those parts soaped before they are washed. Better results are obtained with some heavily-soiled farm washing if a preliminary wash in soapy water to which a little washing soda has been added is followed by a wash in clean soapy water.

Small articles, or delicate articles such as silk stockings, may be placed in a pillow-slip or, better still, in a light muslin or net bag to be washed. Belts are best safety-pinned or loosely tied to prevent their tangling. Handkerchiefs need the usual preliminary soaking in slightly-salted water and washing out before being washed in soapy water. If there are many handkerchiefs, this can be done in the machine before the washing proper is started.

Operation of the Machine

It is important to avoid overloading the machine with clothes, which will cause extra wear on the machine and inefficient washing. The clothes should not be packed tightly, but should be floated in the water and move freely in it. Folds should be shaken out, and the articles put in loosely, distributing the load evenly.

The time to run the machine varies with the make, and usually this information is provided when the machine is bought. Machine washing can be allowed to go on too long, resulting in the dirt being redeposited from the washing water on to the clothes and a bad colour, for once dirt is redeposited it is difficult or impossible to remove in the rinsing process. Therefore it is important to plan the work so that the machine is not run too long with clothes in it. If the work is interrupted, it is best to turn the machine off and, if possible, remove the clothes from the soiled water, so avoiding the risk of dirt being redeposited. Many women find that they can rinse and blue the first load while the second load is being washed in the machine.

When washing woollens by machine it is particularly important that the machine is not run too long, or shrinkage may result. By taking the care usual in washing woollens by hand, and by timing the washing according to the type of agitator used in the machine, it will be found that woollens can be washed satisfactorily.

Wringing

When using a power wringer, which operates faster than a hand wringer, care must be taken to avoid the fingers being caught between the rollers. If such a thing should happen, the emergency wringer release should be used at once.

Distribute the articles evenly along the rollers so that the wear on the rollers is even. Buttons should be folded inside garments, and risk of breakage is less if garments having buttons are fed into the wringer horizontally. Putting the closed ends of articles like pillowcases into the wringer first avoids water spurting out. The wringer pressure should be adjusted according to the articles being put through; use less pressure for buttoned garments and for woollens or delicate fabrics.

If the machine has a spin drier, the clothes must be packed into it evenly to reduce vibration and excessive wear on the machine. The important point is to have the weight distributed evenly in the drier. That can be achieved by spreading the clothes round as they are put in.

Rinsing

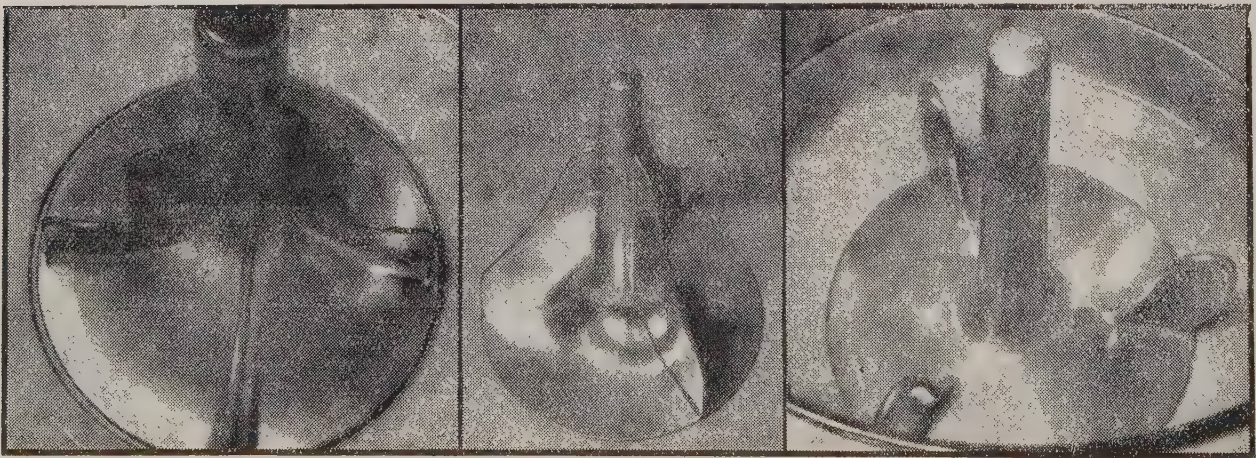
When only one load of clothes is being washed, the washing water can be run off and the clothes rinsed in the machine. Blueing can be done in the machine, but it may be found less satisfactory than doing it in the washtub because the blues on the New Zealand market are solid and distribution in the machine may be uneven. Even distribution is assisted if the blue is mixed with a small quantity of water before being added to the water in the machine.

Whether the rinsing is done by machine or in a tub, the first rinsing water should be softened if necessary, and it should be at the same temperature as the washing water to ensure thorough removal of the soap. Two rinses before blueing are better than one.

Care of the Machine

A dry hand should be used to switch the power on and off; using a wet hand to turn the wall switch is not safe. Pulling the plug out after switching off when the day's work is finished is a good habit.

When the wringer is not in use the pressure should be released completely



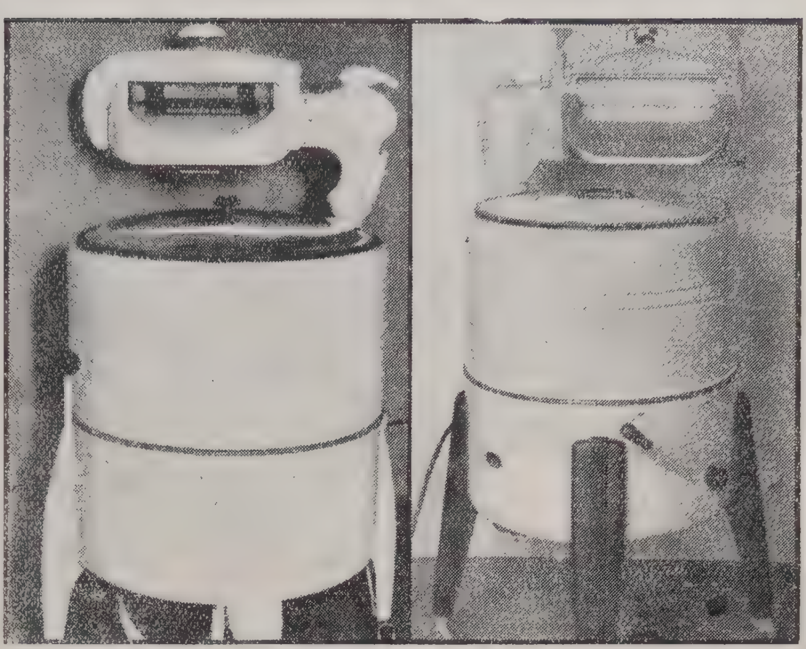
Three shapes of gyrator used in the type of machine most commonly available in New Zealand. The left and right illustrations are of the gyrator in position in the machines shown on the opposite page.

and the wringer switch left in neutral. The rollers should be rinsed with clean, warm water and dried.

The machine itself will not be difficult to clean if the dirty water is drained off as soon as washing is finished. A wash or rinse with hot water is usually sufficient, and then the machine is easily dried. A wipe with kerosene will remove greasy marks. Enamelled outside surfaces may be waxed occasionally if desired. All switches on the machine should be left turned off.

Periodic oiling will be required. This may be done by the selling agent, but if it is not, to keep the machine in good condition the owner must see that the machine is lubricated regularly with the correct kind of oil and as recommended by the manufacturers. The electric motor must be left to an electrician or the machine service-man to oil. It may need to be done only about every 2 years, but it is best to secure advice on this point when buying a machine.

The wringer will require regular greasing by the user of the machine, and petroleum jelly is generally used. Care must be taken that no grease or oil reaches the rollers, for grease spoils rubber. If any should get on by accident, it should be wiped off quickly with kerosene and the rollers washed at once with soapy water, finishing with a rinse of clear water.



Two models of the gyrator-type machine available in New Zealand.

Is Boiling Necessary?

People who are thinking of buying a washing machine often ask if boiling the clothes is necessary. Whiteness depends chiefly on the complete removal of dirt, and for this boiling is not essential. Thorough washing and thorough rinsing out of the washing water are the important points.

Some people say boiling is necessary to sterilise the clothes. That may be advisable with clothes used by victims of infectious diseases, but for the ordinary weekly wash the sterilising effects of soap and water and drying in the open air are quite sufficient. In fact, soapy water itself is a most effective sterilising agent.

Choice of a Machine

Sound construction and efficient washing in a reasonably-short time should be looked for when buying a machine. Another important point is to make sure replaceable parts are obtainable easily. To ensure safety of the user, there should be efficient electrical insulation, and it must be possible to release the wringer immediately if the fingers should be caught in the rollers. Switches should be easy to reach but so arranged that they cannot be turned on accidentally.

For convenience in working, the machine should be of such a height that the operator does not have to stoop or lift things uncomfortably high. Machines vary somewhat in size and, for a household with a large wash, capacity may be worth considering in choosing a machine

The finishings should be such that cleaning after use is easy. Any metals used in construction should be nonrusting, and the gyrator should be easily removed.

Some machines cause more wear of the clothes than others. There should be no corrugated or uneven parts to cause extra wear on the clothes. If a cylindrical machine is under consideration, the edges of the perforations should be examined for sharpness. In the vacuum-cone type the edges of the cones should not be sharp.

The easiest method of emptying a machine is by an outlet at the bottom which can be connected to a drain by a hose pipe. The outlet should be large enough to empty the machine in a reasonable time, and it should be so designed that blockage by threads or loose buttons is unlikely. If the outlet cannot be connected to a drain, a pump for emptying the machine will avoid the necessity of running the water into buckets and possibly lifting them to a tub for emptying.

If no outlet is provided, it may be possible to use a length of hose pipe as a siphon to empty the machine. Immerse the pipe in the water in the machine, beginning with one end so that the hose is completely filled with water. Then, keeping one end under the water and reaching to the bottom of the tub, hold the other end of the pipe closed and bring it out to the drain or bucket which is to receive the water. When this end is below the level of the bottom of the water in the machine, open it and the water will flow out through the pipe.

When a machine has to fit into a certain space, choice must be made accordingly; for some rooms a square machine may be more suitable than a round one. If the machine is to be moved about, such movement should be easy, and the machine should not vibrate to the extent that it will not remain in position during washing. When a machine is to be used in a kitchen, a flat top will provide extra working space when the machine is not in use. Some such machines have a compartment beneath for the wringer so that it may be stored out of the way.

Whether to choose a machine with a wringer or one with a spin drier is another problem. If a wringer is preferred, it should be on a swivel so that it can be used over the tubs as well as over the machine, and it should be capable of taking up a number of positions. Its action should be reversible, and there should be efficient provision for the return of water from wringing to the machine or tub. Drain boards should be rounded and smooth so that nothing can catch on them. Large rollers of soft rubber cause less creasing and less damage to buttons than small rollers of hard rubber. Automatic control of tension is an advantage. A wringer returns the water to the tub, which a spin drier does not necessarily do.

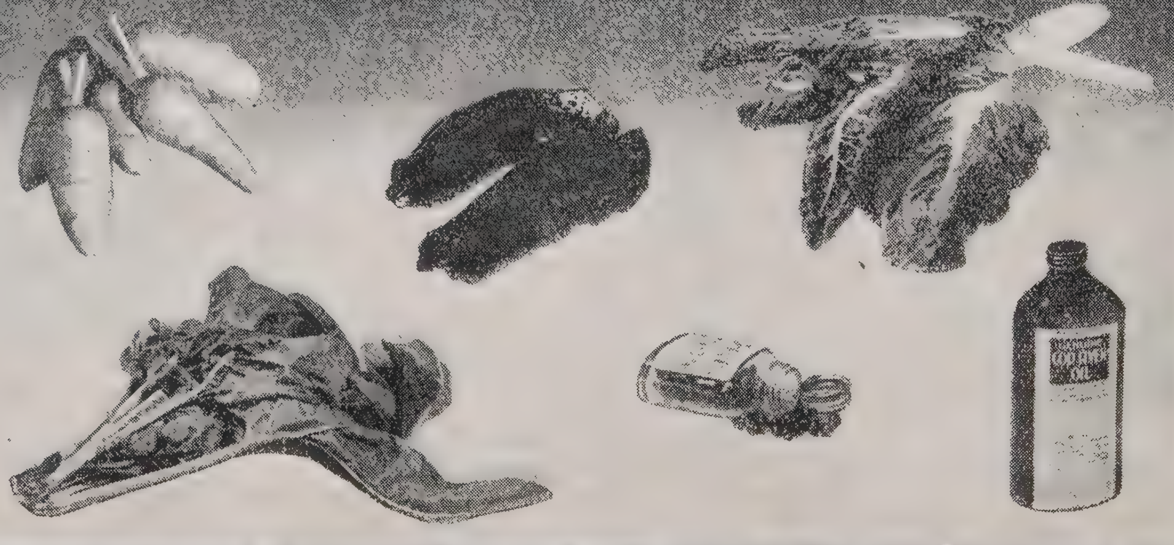
Machines fitted with spin driers take up more room than those fitted with wringers. The whole weight of the wet clothes has to be lifted, whereas only part of the weight has to be lifted to a wringer. Packing has to be done carefully to avoid vibration and excessive wear on the machine. Advantages are that there is more space for clothes, a rinsing tub can be dispensed with, buttons are not damaged, the fingers cannot be caught as in a wringer, and more water may be removed from the clothes. If the spin drier has to be filled more than once from one load of washing, no time will be saved compared with that required to use a wringer.

Washing machines which are completely automatic in operation are available overseas. Though a few have been on sale here, such machines figure only in the dreams of most New Zealand housewives, but there is much consolation in the fact that even such washing machines as can be obtained are among the greatest labour savers of all the devices invented for lightening the housewife's burden.

Vitamin A and Carotene (pro-vitamin A)

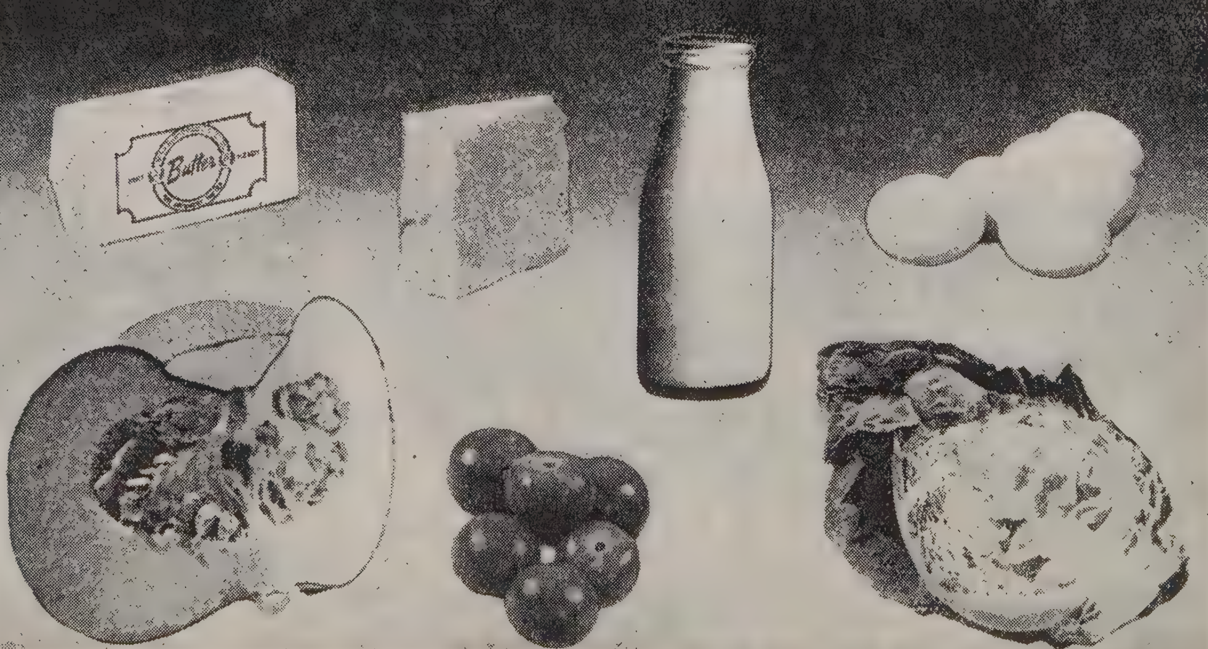
SOME EXCELLENT SOURCES

One serving (3½ to 4oz. of meat or vegetables) provides at least a fifth of the daily requirement



SOME GOOD SOURCES

One serving provides about a tenth of the daily requirement



[Photographs on this and opposite pages by Sparrow Industrial Pictures Ltd.

By EVELYN E. MOORE, Rural Sociologist,
Department of Agriculture, Auckland.

THOUGH most vegetables and fruits are good sources of vitamin A as well as vitamin C, at least one important point of difference between them is that vitamin C is a single chemical substance but vitamin A activity is also possessed by several different substances called carotenes naturally present in foods—that is, they are all able to be used by the body either directly or after they have been changed into the vitamin itself. However, they are able to be used only because all have a very similar chemical structure, though not necessarily an identical appearance.

THAT fact led to some confusion when the nature of vitamin A was first being investigated, for while some scientists found that the yellow pigment carotene, present in the green leaves of vegetables and carrots, satisfactorily prevented the symptoms of vitamin A deficiency, others found that it failed to promote the growth of experimental animals, which grew satisfactorily when fed on almost-colourless fish-liver oils instead. The matter was explained satisfactorily when it was shown, first, that carotene could be converted to vitamin A, which is colourless, and secondly that fish-liver oils contain, as well as vitamin A, vitamin D, which must also be provided in the diet unless there is free access to sunshine.

Occurrence of Deficiency

Mankind has always suffered from vitamin A deficiency, for night blindness, a symptom of a slight deficiency of this vitamin, is described in the manuscripts of some of the earliest historians, particularly those belonging to the cereal- and rice-eating nations such as China and India. The symptoms of more severe deficiency—permanent blindness and a type of severe skin disease—are also mentioned occasionally. Nomads and meat-eating peoples rarely developed vitamin A deficiency, because their diet included such animal products as liver and kidney, and whole milk, butter, and cheese, all reliable sources of this vitamin. The vegetarian, especially if he cultivated few green vegetables or lived in an area where growing vegetables was impossible for a considerable part of the year, frequently suffered from vitamin A deficiency during the periods of vegetable shortage.

In more recent times a shortage of foods rich in vitamin A has been a problem to health authorities in Eastern countries where the diet consists mainly of cereals which contain no vitamin A, and where dairy products are almost unprocurable. It was also noted frequently in Danish children during the First World War, when Denmark sold all her butter to other European countries and so deprived her own people of their best source of vitamin A. During the Second World War health authorities were able to a certain extent to guard against the development of such needless shortages, though the far-from-adequate supply of food of any description was always their most serious problem.

Functions of Vitamin A

One of the best-known functions of vitamin A is its effect on night vision—that is, the rapidity with which the eye becomes adapted to a change in the intensity of light, as well as the ability to see in dim light. This ability is caused by a substance called visual purple which is instantly bleached by light, setting free energy and initiating a series of reactions ending in the sense of vision, just as the spark plug is the means of starting the combustion of petrol in a car engine, and so releasing energy in a different form which is used to run the car as long as the petrol lasts.

A plentiful supply of vitamin A in the blood is necessary if the rate of manufacture of visual purple in the eye is to be maintained at a high level, any deficiency being soon reflected in a reduced ability to see in dim light. (In daylight or bright artificial light a mechanism also requiring vitamin A but not sensitive to dim light is involved in the process of vision.) In fact, investigators are generally agreed that the ability to see in dim light is the first to be affected by a deficiency of vitamin A, so that an examination of this capacity is one of the tests used as a basis for estimating human vitamin A requirements.

A sufficiency of vitamin A is also essential for the maintenance of healthy, normal mucous membranes, such as are found lining various organs (for example, lungs, kidneys, and salivary glands), and for the formation of normal and healthy skin. It its absence the skin and membranes become dry, rough, and scaly and the ducts of glands become clogged with dead, horny cells. A similar effect is produced on the membranes lining the eyelids and covering the surface of the eye, and may lead to blindness—an effect produced only by a grossly-deficient diet and most unlikely to occur in New Zealand.

Perhaps because it is essential to keep the skin healthy and functioning correctly, vitamin A has gained a considerable reputation as an anti-infection vitamin, though the greater susceptibility to infectious diseases of those with vitamin A deficiency is considered to be largely the result of the rough and sticky nature of the skin and linings of organs, which become a perfect breeding ground for bacteria, which cause infections. It has never been shown to have a specific immunising effect, nor has the application to wounds of ointments rich in vitamin A been shown to promote the healing process in normal people.

The consensus of opinion at present is that though resistance to infections is probably lowered by vitamin A deficiency, this lowering is no greater than that occurring during a shortage of any other vitamin, and, provided that the ordinary diet contains sufficient vitamin A, the consumption of medicines, health foods, and oils containing a large amount of this vitamin is probably without effect on the individual person's resistance to infectious diseases.

Vitamin A is also necessary for normal bone growth and development in infants and young children. It is important in the nutrition of animals, for in countries where they have to be stall fed for a greater part of the year, or where they are kept penned, unless ample green food or another source of vitamin A is supplied growth may be stunted, the animals having rough, staring coats and inflamed eyes and nostrils. The vitamin A value of milk and eggs produced by deficient animals and poultry is greatly reduced. The depth of colour in an egg yolk is a fair indication of its vitamin A value, for the colour is caused mainly by the yellow pigments or carotenes which are present in green leaves and able to be converted into vitamin A by the body.

The Well-balanced Diet

Though evidence of the part vitamin A plays in the maintenance of health may be useful to the housewife so that she may evaluate the nutrition information which is now advertised widely—and which unfortunately is sometimes false or misleading—her main concern will be to satisfy her family's appetites and at the same time provide them with not only sufficient vitamin A but all the nutrients required for health.

Thus, it is unwise to concentrate on the provision of any particular nutrient in the diet, for more nutritious diet will probably result if as wide a variety of foods as is practicable is included. If the only vegetable served with meat is potatoes, some nutrients, particularly carotene, which is not present in potatoes, may be deficient. If potatoes and cabbage are served, the vitamin A and C values of the meal will be improved, and if carrots are served as well, the vitamin and mineral values will be even further improved. Nor will the cost be increased greatly if the vegetables are home grown. If labour is the problem, it may be reduced considerably if a portion of a paddock cultivated for other crops is sown in vegetables.

The inadvisability of unduly restricting the diet in its supply of nutrients as a whole applies also to some of the individual nutrients, among them being vitamin A. Several vegetable foods are quoted frequently as having excellent vitamin A value, but the amount obtainable from each may vary considerably because the provitamins or carotenes in vegetables are not so easily absorbed during digestion, and also because more vitamin A can be produced from some carotenes than from others, though the amounts produced from different carotenes are still not determined with any degree of certainty. Therefore authorities recommend that animal as well as vegetable sources of vitamin A be included in the diet, for animal foods contain vitamin A itself, which is more easily absorbed and utilised, and therefore they are a more reliable source of the vitamin. In addition, the diets on which the recommended allowances for the various nutrients are based consist of an ordinary mixture of animal and vegetable foods, between ¼ and 1/3 of the total vitamin A being obtained from animal products.

Sources of Vitamin A

New Zealanders need never go short of this vitamin, for the butter ration of 6oz. a week supplies about 1/5 of the recommended daily allowance, and a pint of whole milk, 2 eggs, or 3oz. of cheese contain a similar amount. Margarine when fortified with vitamin A contains as much as butter and therefore is a valuable food in England, where butter and other dairy products are scarce. There is no vitamin A in skim-milk, which is nevertheless a valuable food because of the other nutrients it contains.

Liver and kidney are the only meats containing appreciable amounts of vitamin A; liver is a very rich source, 1 serving supplying at least the whole daily requirements of an adult. Fish-liver oils are also an excellent source.

Vegetables containing large amounts of carotene or pro-vitamin A—that is, those which provide half or more of the daily requirement in a serving—include yellow-fleshed varieties of carrots, lettuces (provided they are not varieties with large, pale-leaved hearts), and the green leaves of silver beet, spinach, and cabbage. Asparagus, runner beans, brussels sprouts, leeks, peas, and pumpkins are fair sources of vitamin A, an average serving providing about 1/10 of the requirement.

Most fruits do not contain much carotene, but a serving of tomatoes, apricots, rock melon, dried apricots, or prunes will provide about 1/5 of the daily requirement; blackberries, gooseberries, oranges, yellow-fleshed peaches, and plums contain smaller but useful quantities.

The vitamin A value of foods, probably more than that of any other nutrient, varies tremendously with such factors as climate, the variety grown, and the age of the vegetable, so that the figures given are only approximations for use, if desired, in estimating the percentage of the requirement of vitamin A available in the everyday menu.

Fortunately neither vitamin A nor the carotenes from which it is formed dissolve in water, nor are appreciable amounts of either destroyed by heat in normal cooking processes, so little need be deducted from the total for such losses.

Obtaining the Requirement

Estimating the requirement of vitamin A has been rather difficult, for the body has a high ability to store it, so that amounts eaten in excess of that required in one day are kept for use later. This ability has been shown in carefully-controlled experiments with adults, who have been able to live for 6 months or more without any vitamin A before their reserves have been depleted to the extent that symptoms of deficiency become noticeable. In children the amounts stored are less and the needs relatively greater, so that a regular supply is more important for them.

However, consumption of adequate amounts of this vitamin regularly is advisable, for it is doubtful whether irregular, very large dosages are so well utilised, and it also ensures that a store of the vitamin will be available in illness or other circumstances when the intake is reduced unavoidably.

Fortunately two of the basic foodstuffs, butter and whole milk, are good sources of vitamin A, the New Zealand butter ration plus 1 pint of whole milk daily supplying almost half the amount recommended by the American Research Council for an average adult. The rest is obtained easily if one of the vegetables which is a rich source of vitamin A appears on the menu at least 3 or 4 times a week, if eggs are used frequently, and if liver (the best source of vitamin A apart from fish-liver oils) is served once a week, if possible, for expectant and nursing mothers and for children; the liver of home-killed meat should be used whenever it is practicable. The other vegetables, fruits, and cheese included in the diet will also help to supply sufficient carotene and vitamin A to maintain consumption at the necessary level.

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ROYAL VISITORS TO NEW ZEALAND

THE visit of H.R.H. Prince Alfred, Duke of Edinburgh, to New Zealand in 1869 was described in the previous article in this series which appeared in the February issue of the "Journal." This article continues the series by Enid B. V. Phillips on Royal Visits to New Zealand and describes the tour of

The Duke and Duchess of Cornwall and York

IT was not till after the turn of the century that Royalty again visited these shores. Arrangements for the Duke and Duchess of Cornwall and York to undertake a trip to Canada, Australia, and New Zealand were in the course of completion when Queen Victoria died, and though it must have been difficult for the new Sovereign to part with his eldest son during this time of bereavement when he had to shoulder so many onerous duties of state, he put his personal feelings aside and gave his permission to proceed with the original plans. So the Orient Company's steamer Ophir was chartered as a Royal yacht and with the cruisers Juno and St. George as escorts sailed from England on March 16, 1901, to take the Heir Apparent and his consort on the 35,000 sea-mile voyage to the other side of the world and back.

Triumphal Arches in Auckland

The Ophir was due in Auckland on June 10, and several days before this date saws and hammers were being plied with pronounced effect. The driving south-easterly which turned the scoria-paved streets into quagmires did not deter the decorators in the least, and triumphal arches blossomed overnight and native evergreens twined about tall Venetian poles and each citizen tried to outdo his neighbour in the size and splendour of the transparencies in his windows. Under the direction of Lady Ranfurly the ballroom and drawing-room at Government House had been beautified, feathery trails of lycopodium wreathing the gasoliers and festooning the white walls of the lovely room where the Duke of Edinburgh was entertained many years before. The crimson-carpeted dais was flanked with decorative foliage and such a profusion of arum lilies as to astonish the Royal visitors, the blooms being comparatively scarce in England.

Every vessel in the harbour was dressed with a rainbow of bunting and the little ferry boats were crowded with passengers eager to see the big white ship which had anchored off Devonport overnight and was now steaming up the harbour to the sound of a Royal salute of 21 guns from the men-of-war of the visiting Australian squadron, the New Zealand artillery responding with a similar salute from the shore. The Governor, Lord Ranfurly, with the Premier, the Hon. R. J. Seddon, and his ministers went on board the Ophir to present an address of welcome from the people of New Zealand, the beautifully-illumined scroll being contained in a greenstone casket. Then they took up their places on the platform at the head of the wharf. The silvery notes of a bugle proclaimed Their Royal Highnesses' appearance on deck, the Duke in the uniform of a Rear-Admiral and the Duchess wearing black with a matching toque and a feather boa about her neck. As she descended the gangway she had a curiously puzzled, timid, hesitating expression upon her face (to quote the words of an eyewitness) as if she did not quite know what was expected of her. The bronzed, bearded Duke, however, smiled confidently. As they reached the foot of the gangway they paused a moment and the Duchess, with commendable intuition, now stepped forward and pressed the button on the table before her, thereby sounding the signal which spread the news of their long-awaited arrival throughout every town and hamlet in the land. Indeed, the efficiency of the telegraph service was such that the message was received at the Bluff within 2 minutes of its transmission from the Auckland office, the lines having been kept clear for it.

T.R.H. the Duke and Duchess of Cornwall and York.

Colony's Boundaries Extended

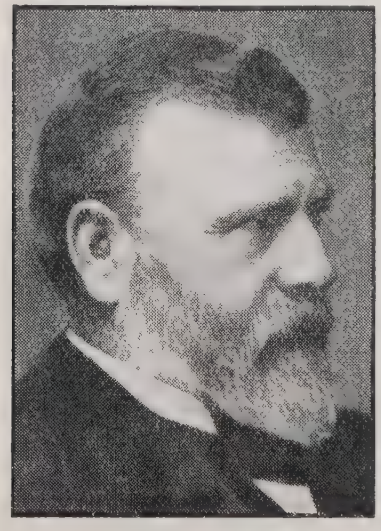
Another momentous happening that day was when Lord Ranfurly read the official proclamation announcing that the boundaries of the colony had been extended to include the Cook Islands and other groups in the Pacific. Two prominent Cook Island chieftains were seated on the dais with the official party, which included Auckland's Chief Magistrate and Mayor, Dr. J. Logan Campbell, who looked very patriarchal in his civic robes. Later he placed the title deeds of his famous One Tree Hill estate (worth many thousands of pounds) in the hands of His Royal Highness, who gladly consented to its dedication as Cornwall Park.

At the Government House reception after the State dinner the ladies all wore half mourning out of respect to the late Queen Victoria, the Duchess being gowned in black satin merveilleux with a collar of diamonds and a diamond tiara. Most of Her Royal Highness's gowns were made by the Maison Frederic, London, from the richest materials obtainable from English and Irish looms. The chief fashion accent was in the matter of sleeves, which were extremely elaborate. Puffs predominated, especially at the elbow, and often the rest of the sleeve was tight-fitting right to the wrist and garnitured with lace or embroidery. Sometimes when the upper part of the sleeve was composed of triple puffs each puff would be tied with ribbons, and a chou of flowers or a chic ribbon bow was used to adorn another type of sleeve where two points of lace met in the centre of the upper forearm. Evening gowns had shoulder straps of velvet, jewels, or flowers, with a second strap falling below the shoulder in the merest hint of a sleeve. An equally striking effect was obtained by bouffants drapery of tulle or mousseline from the shoulder strap, leaving the top of the arm bare. Whether full length or only a decorative suggestion of a covering, the Duchess's sleeves were truly a triumph of artistic ingenuity and set a new style among the more fashionable members of the colony's feminine population.

ROYAL VISITORS TO NEW ZEALAND . . .

Duke Dazzled all Eyes

All the same it was the Duke who dazzled all eyes with the splendour of his attire when he reviewed the troops in Potter's Paddock and presented medals to the returned contingents from the South African campaign, New Zealand having sent more men to the front in proportion to her population than any other part of the Empire. He rode to the parade in the scarlet uniform of a Colonel of the Fusilier Guards, complete with a huge busby which tended at times to tilt forward and slightly obscure his view. The Duchess's brother, Prince Alexander of Teck, who had served in Matabeleland and South Africa, and was now A.D.C. to the Duke, was in Hussar uniform and both Viscount Crichton and the Duke of Roxburghe wore the gleaming cuirasses and waving plumes of the Royal Horse Guards.



[*S. P. Andrew Ltd. photo.*

The Rt. Hon. R. J. Seddon, Prime Minister when the Duke and Duchess of Cornwall and York arrived in New Zealand.

There was little respite from official duties with a Veterans' luncheon to attend, a State dinner, and a Mayoral reception timed for 9.45 p.m., and in order that the Duchess might obtain a modicum of rest, the Duke deputised for her in laying the foundation-stone of the Victoria High School for Maori girls at Parnell. The Maori children's singing greatly appealed to His Royal Highness and their tuneful haka so amused him that he insisted on an encore.

Maoris at Rotorua

He became further acquainted with the Maori people during his visit to Rotorua, the train in which the Royal party travelled creating a record by covering the journey in 7 hours. The ordinary express took 2 hours longer. The dusk was deepening as the Duke and Duchess descended from the train and hundreds of natives, bearing leafy branches, leaped and postured before them. Some of the leading chiefs were clad in choice mats, others wore the frock coats and bell-toppers of civilisation, but all joined with equal fervour in the powhiri, the chant of welcome. The Maoris' joy communicated itself to all beholders, causing their hearts to throb, their pulses to beat faster. Waving their weapons they rushed after the Royal procession with exultant cries, Their Royal Highnesses being obviously fascinated by this strange, dramatic sight. They were met at the entrance to their hotel by a party of poi dancers who performed their graceful movements, at the same time "speaking with their expressive eyes more haeremais than their tongues could utter." The Native Minister, the Hon. James Carroll, in a speech glowing with the poetic imagery and rhythmical cadences characteristic of Maori oratory at its finest, voiced the sentiments of his race toward the grandson of the illustrious Queen whom they had revered so deeply.

Ancient Ceremony of Welcome

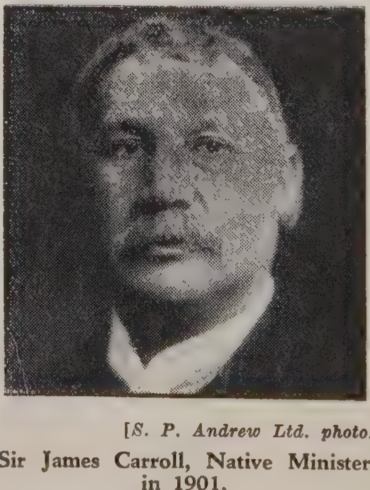
The early morning sun shining on the huge columns of steam rising from the hot springs changed them to shimmering gold, making it a perfect day for visiting the pretty little lakeside village of Ohinemutu where the Mao Arawa tribe had assembled in front of the whare-runanga, the carved meeting-house, to receive the Royal guests with the ancient ceremony of welcome, the chief standing before the statue of Queen Victoria in the centre of the courtyard to present them with gifts of mats and greenstone meres in accordance with the native custom of bestowing offerings in memory of the departed. Then they drove to Whakarewarewa and "did" the sights just like any other tourists, the Duke in charge of Guide Maggie and the Duchess accompanied by the soft-voiced Sophia, survivor of the terrible Tarawera eruption in 1886, when the pink and white terraces were destroyed.

When they reached the plateau the Pohutu geyser was playing and by a little judicious soaping Wairoa was induced to perform also. Never had the guides' tales been listened to with greater attention, nor had they escorted visitors more eager to see the marvels of this thermal wonderland. While they were passing the native houses, the owners of which had put their potatoes and other edibles to cook in the boiling pools outside, a band of Maori youngsters shyly offered the Duchess some childish gift, whereupon Her Royal Highness smilingly shook hands with each one of them right down to the tiniest toddler to the tremendous pride of all concerned. Before crossing the lake by the steamer Hamuana to view the hot springs at Tikitere the party was entertained by a picturesque assembly of poi dancers and teams of stalwart warriors who engaged in tribal hakas each more fearsome than the last.

This was but a foretaste of events to come, for the following day a great hui was held at the racecourse, the natives having journeyed from the most distant parts of New Zealand to pay homage to the Royal couple. The Duchess completely won the hearts of the vast gathering by draping over her black costume the kiwi feather mantle given her at Ohinemutu and placing in her bonnet a trio of white-tipped huia feathers, thus identifying herself as a chieftainess of the Maori people. The Duke, too, had donned the emblems of a rangatira. The Hon. James Carroll, wearing a dog-skin mat over his suit, was the master of ceremonies, and for close on 3 hours the quiet plain resounded to the war chants of bygone days as the mighty fighters of each tribe in turn flung themselves into the frenzy of a war dance. (Apirana Ngata, M.A., LL.B., led his tribesmen, the Ngatiporou, in their haka.) At length the maidens began the poi dance of peace, singing as they twirled their pois: "Oh, Princess, you have come to add lustre to the Maori people."

Presentation of Priceless Gifts

Then the chiefs and chieftainesses came forward with priceless gifts—feather cloaks and flax mats of the finest weaving in the "falling water" pattern, ancient tikis and taiahas, greenstone meres and patus of polished whalebone—laying them before the Duke and Duchess till they were nearly buried beneath the pile of treasured tribal heirlooms. The venerable chief Te Pokiha, better known to the pakeha as Major Fox, whose bravery won him a sword of honour from Queen Victoria, rising from his seat beneath the flag the late Duke of Edinburgh had presented to his Arawa bodyguard long years ago, now gave His Royal Highness a carved model of the canoe in which his ancestors had voyaged to New Zealand. (The Duchess, concerned at his only too evident frailty, had asked him at Ohinemutu pa the previous day why he had ventured out, and the white-haired warrior had replied with the inherent courtliness of his race: "My joy at the hope of seeing you was so great that I could not lie down.") When the Otaki maidens had finished their single and double poi dances they advanced in single file and, bowing gracefully, placed their pois at the feet of the Duchess, an unexpected tribute which so charmed Her Royal Highness that she leaned down and touched the hand of the last little dancer, a mere child, as she went laughing past. The Duke's speech of thanks was loudly cheered: "Kiaora te Tuika!" ("Long live the Duke!"), and



[*S. P. Andrew Ltd. photo.*

Sir James Carroll, Native Minister in 1901.

The Duke and Duchess of Cornwall and York leaving Parliament Buildings, Wellington, on June 19, 1901, after the Duke had presented war medals to returned servicemen.

he presented the leading members of the tribes with commemoration medals, some of gold and others of silver.

Wellington on Waterloo Anniversary

The Main Trunk railway was not yet completed, so Their Royal Highnesses travelled to Wellington by sea. By a happy coincidence they landed in the capital city on June 18, the 86th anniversary of the victory of Waterloo. Had the British suffered defeat that day, the fair city which is named after their great leader, the Duke of Wellington, would probably never have been founded, but remained a wilderness of bush and bracken. As the Ophir berthed at the wharf the blustery storm subsided and became what a loyal Wellingtonian described as a mild, respectable, rainless nor'-easter. Judging by the way the storms in Auckland and Rotorua melted at their approach Their Royal Highnesses apparently possessed some "weather mascotte" which made sunshine out of winter blizzards. The authorities had concentrated chiefly on triumphal arches in their decorative scheme for the city and it is estimated that 50,000ft. of timber were used in the construction of the different Government arches and platforms alone, and 12,000yds of fabric for the draping of the Parliamentary and Departmental Buildings. The Cereal Arch, contributed by the suburban boroughs of Wellington and Marlborough, with its flax-covered pilasters, its shafts of wheat, oats, and barley sheaves surmounted by scythes and pitchforks, was distinctively novel, as was the Chinese Arch, a pagoda-like structure flying the Chinese flag and decorated with dragons, dolphins, and other quaint oriental designs.

The Duchess was presented with a beautiful bouquet of white flowers and maidenhair fern by the Harbour Board chairman's daughter, Miss Jeanne Beauchamp, whose older sister, Katherine Mansfield Beauchamp, became New Zealand's brightest star in the literary firmament. After the Mayoral welcome the Royal procession commenced through the streets, which were crowded with visitors. It is said that the burgesses of Wanganui came in such numbers as to justify the posting of a placard in a prominent position, "To let, for a week, the town of Wanganui." Some of the spectators on the roof overlooking the Dairy Arch, not knowing that Their Royal Highnesses' suite preceded them, mistook the carriage in which Prince Alexander of Teck was travelling for the Royal carriage, and cheered vociferously to the embarrassment of the Prince, whose colour heightened as the eyes of the crowd focused on him. He must have been relieved when they sighted the occupants of the carriage behind and centred their attention upon the rightful Duke and his Duchess.

Consular and ministerial receptions, a Court of Investiture whereat the Colonial Secretary, the Hon. J. G. Ward, was invested as K.C.M.G., a banquet to returned troops and veterans, State dinners (at which the sombreness of Her Royal Highness's gowns was offset by the dazzling brilliance of her diamonds), the laying of the foundation-stone of the Town Hall, a choir of 250 voices giving an admirable rendering of the ode specially composed for the occasion by a local poet and set to music by the conductor—function followed function in swift succession. Yet Their Royal Highnesses, always ready to support actively a charitable cause, managed to find time to attend the Maoriland Fete in aid of the Victoria Home for Incurables. The bazaar was opened by Lady Ranfurly, the price of admission to the ceremony being half a guinea; at later sessions the charge was reduced to one shilling. The Duke and Duchess arrived at ¼ to 4, and, after making such purchases as a pair of china vases, some Jeypore brasswork, a Maori doll for their small daughter Mary, several ornamental matchboxes, cushions, and carved walking sticks, they shook hands with some of the stallholders in their demure Quaker garb of grey and white, and took tea at the fete's cafe chantant, using china from the Empire stall and

ROYAL VISITORS TO NEW ZEALAND

The main features of Dunedin's decorations for the Royal Visit were four arches—the Chinese arch, marine arch, municipal arch, and Government arch. The municipal arch, shown above, was erected at the Princes Street entrance of the Octagon. It was 40ft. high and on the tops of the towers was a small band of Maoris to shout welcomes.

lizard and elephant spoons that had been sent from Ceylon. The bonds of Empire were further strengthened the next day when "The New Zealand Times" published the first chapters of its new serial, the immortal "Kim," by Rudyard Kipling.

The Duke and Duchess also fitted in a visit to the woollen mills at Petone, the first mills of this kind they had ever inspected, and at the Gear Meat Company they were so keenly interested in all they saw that at their own request they were even taken into the freezing chambers. Furthermore, they accepted an invitation to taste a sample of tinned meat.

The women of Wellington gave the Duchess a model of a Maori house, the one owned by Lady Ranfurly being lent for the occasion, as the carving on the other was not quite finished. It would be forwarded to England, however, as soon as possible. Other presents which pleased Her Royal Highness very much were a fern album from Premier Seddon, a boulder of West Coast greenstone, and an advance copy of the memoirs of John Plimmer, "the father of Wellington," bound in royal blue morocco with touches of red leather and devices in vellum, the inside of the covers being satin-lined. The flowers she received when the Duke laid the foundation-stone of the new Railway Offices provided her with an unusual souvenir in the shape of a bouquet-holder of greenstone studded with pearls.

Canterbury's Jubilee

The Ophir left Wellington in the late afternoon of the shortest day in the year, but as she sailed down the coast of the South Island bonfires on hills and headlands blazed a welcome through the long, dark hours. The Duke and Duchess landed in the same small bay in which the Pilgrim Fathers disembarked from the first four ships, the emigration venture having the Archbishop of Canterbury and Lord Lyttelton as sponsors, and it was surely a happy omen that the Royal arrival coincided with Canterbury's Jubilee, and during Their Royal Highnesses' procession through Christchurch a halt was made in Victoria Square to do honour to the late Queen under whose beneficent rule the colony had made such wonderful progress. As they were passing the Cathedral there was a lull in the cheering and a complimentary remark made by a man in the crowd was clearly audible and certainly reached the ears of Royalty, for the Duchess turned in his direction and rewarded him with a bewitching smile. All sections of the community contributed to the welcome, from the old age pensioners who presented a loyal address (the pension scheme had not yet been adopted in England) and the bemedalled veterans who braved the bitter morning frost to march in the military review at Hagley Park, right down to the 8000 schoolchildren, whose singing of the National Anthem was as vigorous as their waving of the toi toi plumes they carried, the bystanders being liberally sprinkled with the feathery white seeds. On Sunday Their Royal Highnesses attended Divine Service at the Cathedral, when Canon Julius preached an excellent sermon precisely 12 minutes long.

The Journey South

As the Duchess boarded the Royal train which was to take the party south she carried a fragrant bunch of violets, the farewell gift of Master Tahu Rhodes, the young son of the Mayor and Mayoress of Christchurch. At intervals along the line stood little groups of settlers, many having ridden or walked for miles to gain a fleeting glimpse of the Royal visitors as the train sped past. The first stopping-place was Ashburton, where the townsfolk tendered them a reception and the Temuka native schoolchildren welcomed them in Maori fashion with presents of a feather mat and a walking stick. Their Royal Highnesses lunched at Timaru and hundreds of children serenaded them with "God Save the King," and the dux girls of the three town schools prsented the Duchess with a bouquet from the pupils, who were immensely pleased with her kindly reception of them. The Waitaki High School cadets formed a guard of honour at Oamaru, and though the train stopped only 3 minutes at Shag Point, it was sufficient time for that aged and eminent statesman, John McKenzie, to be brought on board and have conferred on him the insignia of knighthood. When Port Chalmers was reached the train slowed down almost to stopping point as the steamers sounded their whistles, the bells pealed, and the port was lit up by the red fire of rockets, a fitting prelude to the welcome awaiting them in Dunedin, where the Duchess received her sixth bouquet that day and the Otago Hussars and the North Otago Mounted Rifles formed an escort through the streets, which had been converted into ferny bowers in which fountains played. Despite the fact that their sojourn in the city of the Scots was curtailed to one day, the citizens made it a worthy climax to the tour. In fact, the visiting English journalists declared that the cheering in Dunedin was the loudest they had heard throughout the whole country. The high light of the celebrations was the demonstration of marching, wand exercises, and physical drill by 3000 children representing 23 public schools, the proceedings being directed by two instructors perched atop a tall tower on wheels.

The return journey to Lyttelton was broken only at Timaru, the Duchess being presented with yet another address, this time from the women of New Zealand, who expressed gratification at the visit to the colony in which the female sex enjoys rights that widen its sphere of usefulness without interfering with perfect home life and domestic felicity. On arrival at Lyttelton Their Royal Highnesses embarked on the Tutanekai, and after being farewelled by the Premier, the Hon. R. J. Seddon, Sir Joseph Ward, and the Hon. James Carroll, the Government steamer took them out to the Ophir in the stream, and the Royal yacht weighed anchor and headed for Hobart, accompanied by her escorts, the Juno and St. George.

Quickly-made Table Linens for Everyday Use

THE fancywork section of any agricultural and pastoral show displays supper cloths which are a tribute to the skill and patience of their makers. Elaborate embroidery and crocheted or tatted edgings are combined to make articles which will become treasured possessions and family heirlooms. The average housewife cannot make, and does not want, precious things like these for everyday use, nor is gleaming white damask, once almost universal, so popular now. However, ideas for cheerful and quickly-made table mats, and cloths that are a little out of the ordinary while still being strong and serviceable, will be welcomed by women who like sewing. This article by Norma K. Metson, Rural Sociologist, Department of Agriculture, Wellington, describes materials to use, how to make different kinds of cloths and mats, and some stitches and sewing techniques which can be used in many different ways.

RESISTANCE to soiling, ease of laundering, and the ability to look fresh after repeated washings are the chief requirements in table "linens." These qualities are found especially in real linen with its smooth fibres, natural sheen, and enduring strength, but linen is scarce and expensive now, and specially-treated cottons and rayons are the usual substitutes. Both dress and furnishing fabrics can be used and are not extravagant—a yard or a yard and a half of 36in. material will make a set of table mats, and 3yds. a cloth and table napkins.

Choice of Materials

Furnishing fabrics: Furnishing linens, cretonnes, and glazed chintzes are obtainable in gay colours and attractive patterns which make them very suitable for table mats. Choose small, all-over patterns for economical cutting, or a large repeated motif which can be featured in the centre of each mat. A single rose or a bunch of flowers from one of the conventional chintz or cretonne patterns looks well on a circular place mat (about 12in. in diameter), and smaller circles can be cut from the striped or sprigged background. If hemstitching is to be used as a finish, choose a fabric with a plain, square weave and with threads of similar size lengthways and crossways. Glazed chintz has an added advantage: It can be wiped over when necessary and therefore needs less frequent washings.

Cottons can be linen finished and specially woven for table use, but they should be starched to retain a crisp, fresh appearance. A smooth, heavy-weight gingham is very adaptable and suitable for everyday use. The 36in. width can be used for mats, and 48in. and occasionally 60in. widths can be found from which to make square or rectangular cloths. The checked patterns are attractive in themselves and can be made the basis for simple decorative embroidery in cross-stitch, blanket stitch, and feather stitch. Plain cottons can be appliqued with cut-out flowers or trimmed with gay crochet borders in solid or blended colours. Floral materials are decorative enough as they are, but hems finished with hand or machine hemstitching in the dominant colour of the pattern provide the necessary finishing touch. Linen hand towelling and tea towelling are sometimes available by the yard in widths and patterns suitable for table mats.

Plastics: Sheet plastics and plastic-coated cottons are special-purpose fabrics. Plastic-coated cotton is similar to American cloth, but lighter in weight so that it drapes more easily. It can be washed when necessary, but wiping it with a damp cloth will keep it clean, so it is invaluable for kitchen and picnic table cloths, frequently-used tray cloths, and small children's feeders or place mats. Sheet plastics are not so durable and tear more easily, but are obtainable in very attractive colours and patterns. Both types of plastics may be finished by machine hems or bias binding, sewn with a large stitch, or merely cut with pinking shears. For attractive tray cloths or wagon covers, transparent plastic can be stitched over oddments of pretty material left from dressmaking or household sewing.

Techniques to Use

Mitring corners (Fig. 1) avoids the unsightly lumps which occur when hems are folded over each other at corners. Fold the material over the full width of the hem allowance and crease it down the 2 sides, thus outlining a square at the corner. Mark the diagonal of this square and cut along a line parallel to and just outside it (A-B). Keep the triangle which has been cut off to use as a pattern on the other corners. Fold the material, wrong side out, along the diagonal X-Y so that points A and B and points C and D come together. Stitch the material about $\frac{1}{8}$in. in from the raw edges, starting at E and finishing where C and D coincide. Do not continue stitching right to the edge, and make sure that both ends are securely fastened. Turn the corner right side out, push out the point carefully, and press the corner flat. An alternative method is to cut along A-B as before, turn over the edge along C-D, fold and tack the hem, and catch the edges of the mitred corner together on the right side with invisible stitches.

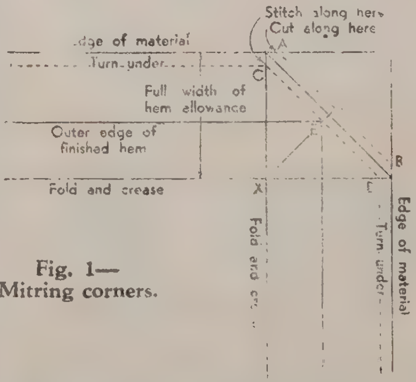


**Fig. 1—
Mitring corners.**

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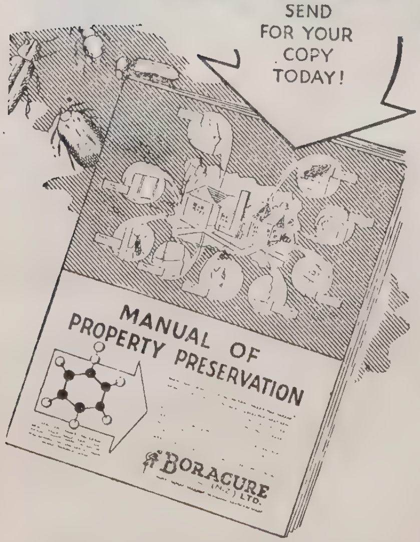
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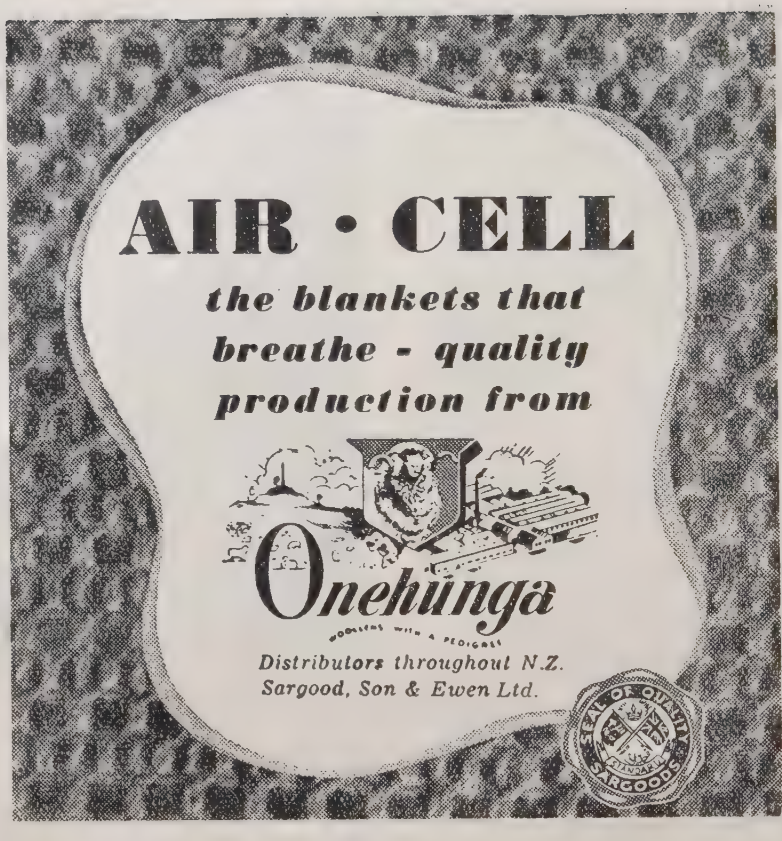
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HOT WEATHER

Kitchen Quiz

How can I keep MILK from souring?

Have it delivered to a shady spot and bring inside to a cool place as soon as possible.

If you have not the benefits of pasteurization and have not access to a refrigerator, either:—

Scald immediately and pour into a clean jug.
Cool the jug *rapidly* by standing it in cold water in a cool, airy place.
Cover the jug with clean muslin.

Or, if you want to keep milk fresh without heating:—

Stand the jug in a bowl of cold water.
Cover it with clean, wet muslin, making sure that all ends are in the water.
To scald is the safer method, especially where there are children.
Do not mix milks of different ages.

How can I keep SALAD GREENS crisp and fresh?

Try to use as soon as picked or bought, but when this is not possible, e.g., over holiday periods:

Wrap the greens, unwashed, in paper and keep in a cool, airy place.

Do not soak or wash before required, and when buying greens ask for ones that have not been hosed.

How can I keep BUTTER firm?

Place your butter on a plate or saucer on a wire grid over a bowl three-quarters full of cold water. Cover the butter with a wet muslin, making sure that the edges dip into the water.

Or

Place a clean brick in a dish of water. On this put your butter on a plate or saucer and cover with wet muslin, again making sure it dips into the water.

Be sure that:

the cloth is always moist
you renew the water daily
you wash the brick or wire grid daily
you rinse out the cloth daily.

With acknowledgements to the Ministry of Food, London.

ISSUED BY THE DEPARTMENT OF HEALTH. 14.48

Hemstitching (Fig. 2) is the traditional method of finishing the hems of table linens, and produces a neat appearance on both right and wrong sides. Sometimes only the hem side is stitched, but a better appearance is produced if both sides are done. Two methods are illustrated, A and B. A is worked in the same direction as ordinary hemming; B is worked from right to left. Though the finished result is similar, the 2 stitches differ a little in detail. Experiment to see which is preferred for appearance and ease of sewing. Both require 2 steps, the first consisting of picking up the desired number of threads and the second of taking a stitch through the hem. The number of threads picked up is usually 4, but varies with the coarseness of material and whether particular decorative effects are desired. When drawing the threads for hemstitching, do not pull them out right to the corners. Cut the threads a short distance from each corner, as shown in the diagram, and turn these short lengths back under the hem. This prevents fraying and untidiness at the corners of the hem. After pulling the threads, mitre the corners, tack down the hem, and stitch it (Fig. 3).

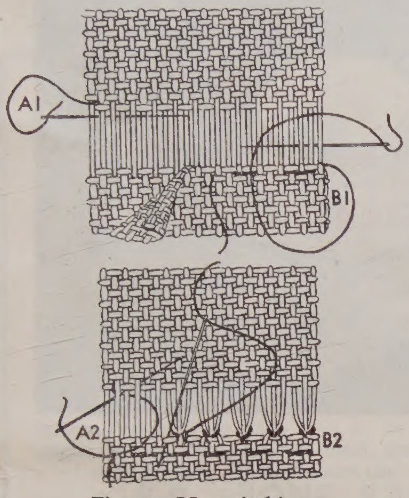


Fig. 2—Hemstitching.

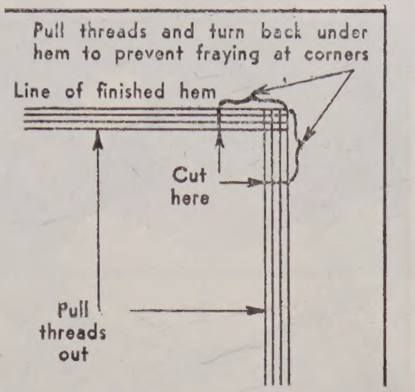

Pull threads and turn back under hem to prevent fraying at corners
Line of finished hem
Cut here
Pull threads out

Fig. 3A—Pulling threads before hemstitching.

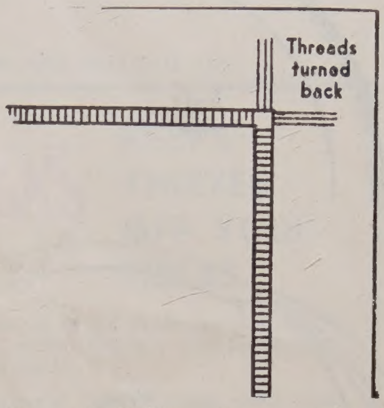
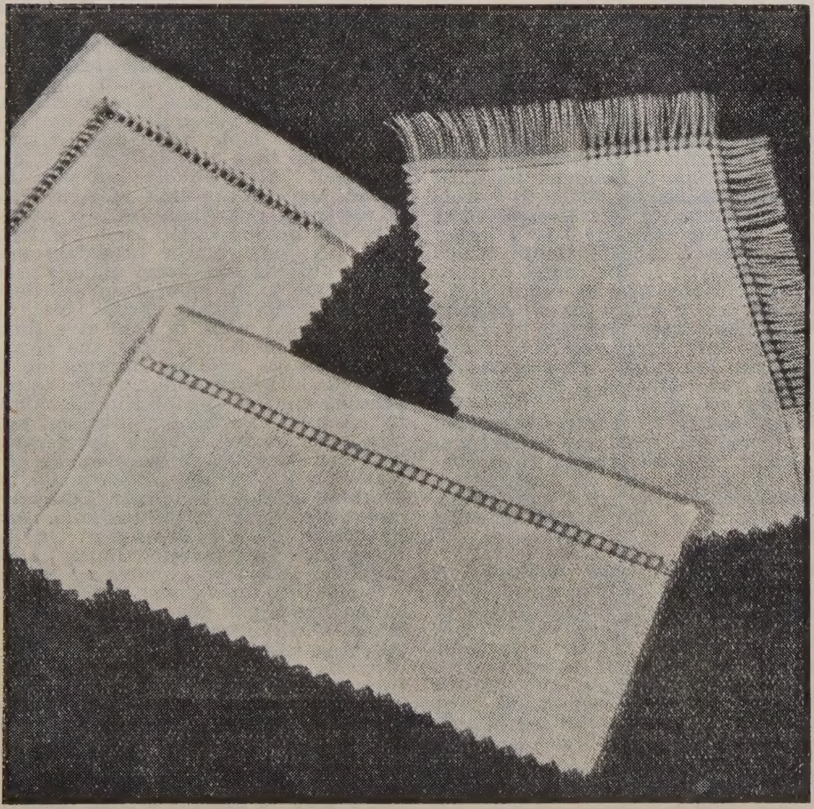
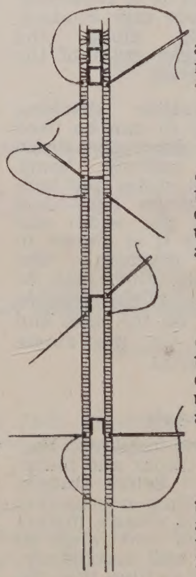


Fig. 3B—Pulling threads before hemstitching.



The wrong side of hemstitching (left), showing a mitred corner, and square stitching with a hemmed and a frayed edge.

Square stitch (Fig. 4) is a decorative stitch which is done before the hem is turned. Pull a thread the desired distance from the edge of the material. Count in the desired number of threads (usually 4) and pull another thread. Proceed as follows:—



1. Needle diagonally across under the material, advancing 4 threads.
2. Needle back over 4 threads on the same side, then diagonally across under the material, advancing 4 threads.
3. Needle back over 4 threads on the same side, then diagonally across under the material, advancing 4 threads.
4. Needle under the material straight across, coming out at the same place as in 3.

Fig. 4—Square stitch.

Repeat these 4 steps, producing a single stitch over the threads at the sides and a double one over the solid material in the centre. After the square stitching has been completed the material can be frayed to the edge, or finished by turning a hem and catching it down with invisible stitches on the wrong side.

QUICKLY-MADE TABLE LINENS FOR EVERYDAY USE

Bias binding for circular mats (Fig. 5): Have the binding flat, lay it on the edge of the mat right sides together, and stitch the edges together ⅛ to ¼in. from the edge. Fold the binding over to the wrong side, turn in the raw edge, and slipstitch. If it is necessary to join bias binding, stitch along the straight grain of the material.

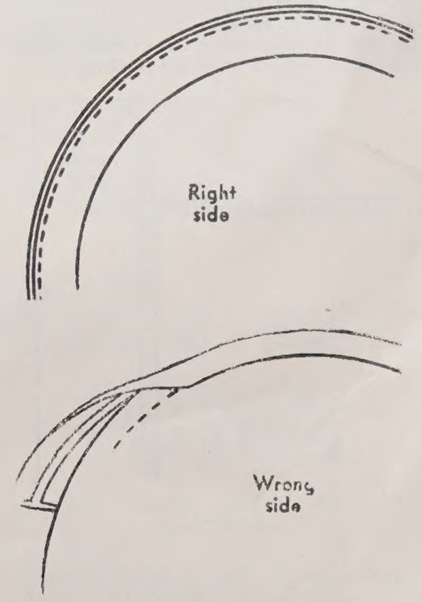


Fig. 5—Bias binding.

Feather stitching (Fig. 6) can be used as a decorative finish on narrow hems. Turn under and tack a narrow hem (less than ¼in. wide) and stitch it as shown in the diagram. The whole stitch may be made on the hem, or half on the hem and half on the single material.

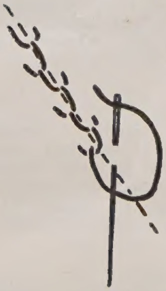


Fig. 6—Feather stitching.

A morning tea tray showing a cloth of plastic sheet material with pinked edges. This material can be obtained in very attractive colours and patterns.

Making Cloths and Mats

Two-colour cloth and napkins: Buy 1½yds. each of 2 plain-colour and plain-weave cotton fabrics. Select colours which are fast to boiling, or running may be a problem, and choose materials of the same brand and range so that shrinkage, if any, will be uniform. Straighten the ends by pulling threads, and cut a 9in. strip from the side of each piece. Overlap selvedges ¼in., and tack and machine stitch as close to the edge as possible, using colours on the top and spool of the machine to correspond with the materials. Turn the material over and stitch down the other side, reversing the top and spool colours. Finish by machine stitching a narrow hem round the edges, using top and spool the same colour and changing both to the other colour where the materials join. Make table napkins in a similar manner from the narrow strips. This material will make 3 napkins 18in. square, 4 13in. x 18in., or 4 13in. square; the cloth is 54in. square.

Circular place mats: If an all-over pattern is chosen, 1yd. of material will make 6 mats 12in. in diameter for place mats, 3 mats 9in. in diameter for meat and vegetable dishes, and 6 to 9 mats 4in. in diameter for glasses and other dishes. If the material has a larger pattern, with a repeated motif which would look well in the centre of each mat, up to 1½yds. may be required for a similar set to allow for wastage in cutting. Make paper patterns by drawing circles with compasses, or by drawing round the edges of objects the required size. Making a tidy hem on a circular mat is difficult and the most suitable finish is a binding. Use bought bias binding of a matching or contrasting colour, or make binding from 1in.-wide strips of self or contrasting material cut on the cross and joined. Allow 12yds. of binding for the set described.

Gingham cloth and napkins: A breakfast cloth and 4 12in.-square table napkins can be made from 1 2/3yds. of 48in. gingham. Cut a piece 48in. square for the cloth, and cut the remaining piece (12in. x 48in.) into 4 12in. squares for the napkins. Turn and tack a narrow hem, and feather stitch. The selvedge edges need be turned in only once.

Quilted chintz: Glazed chintz mats usually are backed with some heavy material, such as velour or felt, and quilted so that they may be used directly on the table without needing a cork or rubber mat underneath. Circles of the sizes given are suitable, or the mats can be rectangular, of a finished size about 10in. x 16in. However, sizes can be varied to suit the pattern of the material and the size and shape of the table. Indeed, when planning table mats it is a good idea to cut out a whole set of paper patterns and try them on the table, adjusting the sizes until those that fit and look best are obtained. Alternatively, set out the dishes and cutlery that will be used at the meal, and make mats of a size that will accommodate them comfortably. A luncheon or breakfast mat where a bread and butter plate is used in addition to the main plate will need to be larger than a dinner mat on which only 1 plate is used at a time. For the quilted mats, tack the chintz firmly to the woollen backing or, if padding is being used, to the cotton padding and muslin interlining. Quilt by machine in a regular diamond pattern. Finish by binding (preferably with self material) if the mats are circular, or by turning under and slipstitching on the wrong side if they are rectangular. If cotton padding and interlining have been used, it will be necessary to add an outer lining of, for example, sateen in a matching colour.

Furnishing linen mats: Mats of furnishing linen look best if they are finished with hemstitching or square stitching and a ½ to 1in. hem. Other methods are a square stitching and fraying, fraying with a single row of machine stitching in matching cotton at the base of the border to prevent further ravelling, or if the material is closely woven and not slippery, fraying alone. However, mats with frayed edges tend to become a little shabby-looking after relatively-short use.

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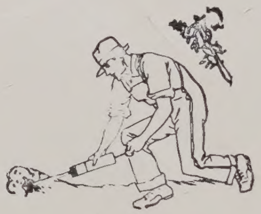

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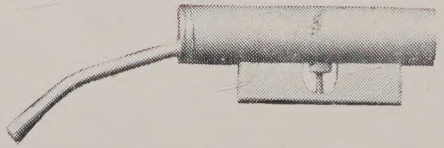

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